amateur radio

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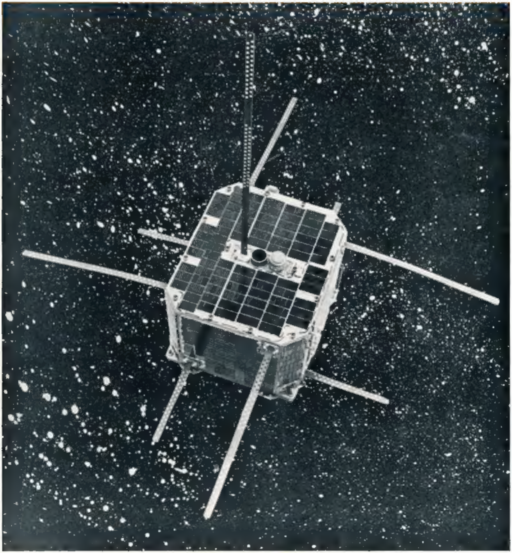

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Reg. Office: 478 Victoria Parade, East Melbourne, Vic., 3002.

Editor:
K. E. PINCOTT VK3AFJ

Assistant Editor:
E. C. Manifold VK3EM

Publications Committee:
Ken Gillespie VK3GK
Harold Hepburn (Secretary) VK3AFQ
Peter Ramsay VK3ZWN
W. E. J. Roper VK3ARZ

Circulation—
Jack Kelly VK3AFD

Draughtsmen:—
Clem Allan VK3ZIV
John Blanch VK3ZOL
John Whitehead VK3YAC

Enquiries:
Mrs. BELLAIRS, Phone 41-3535, 478 Victoria Parade, East Melbourne, Vic., 3002. Hours: 10 a.m. to 3 p.m. only.

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COVER STORY

An artist's impression of the type of satellite that OSCAR 6 will probably be. The surface of the package is covered with solar cells, which should give the satellite an active life of at least one year.

W.I.A's Preliminary Comments on the 1971 Space Frequency Conference

Previous Federal Comments and the last Annual Report of the Federal Executive have referred to the 1971 World Administrative Radio Conference relating to space services.

The Federal Executive, on behalf of the Federal Council, has now submitted to the Australian Administration the preliminary comments of the W.I.A. in relation to the forthcoming Conference.

Having regard to what I consider to be the importance of this initial statement, this Federal Comment is devoted to the full text of it.

—Michael J. Owen, VK3KI,
Federal President, W.I.A.

1. WIRELESS INSTITUTE OF AUSTRALIA

The Wireless Institute of Australia (W.I.A.) is the single body representing Amateur Service in Australia. Just over one half of all Amateur licensees in Australia are members. The W.I.A. is a member of the International Amateur Radio Union (I.A.R.U.), a world-wide organisation made up of the National Amateur Radio Societies in 83 countries and administrations throughout the world. Through this organisation the W.I.A. is aware of the views relating to the forthcoming World Administrative Radio Conference in many countries. In addition, the W.I.A. has been responsible for the inauguration of an association of National Amateur Radio Societies within Region 3 under the auspices of I.A.R.U. At present the W.I.A. is providing a Secretariat for this organisation.

In addition, it is directly interested in the utilisation of Amateur bands for space purposes, as it includes within it the W.I.A. Project Australis Group, the group responsible for designing and constructing the Amateur Satellite Australis OSCAR 5.

2. RADIO AMATEURS AND SPACE COMMUNICATION

The following extracts from Docket No. 18294 submitted jointly to the Federal Communications Commission on 29th April, 1970, by the American Radio Relay League (A.R.R.L.) and the Radio Amateur Satellite Corporation (A.M.S.A.T.) are of interest in the present context:

"Radio Amateurs have played a most important role in the development of space exploration and communication. In recent years, two organisations [in the United States] of dedicated Radio Amateurs, working in their spare time and without compensation other than the personal pleasure that comes from making contributions to society, have made most significant contributions to the development of the space techniques and experience . . . The first was Project OSCAR Inc.—OSCAR means 'Orbital Satellite Carrying Amateur Radio'—organised in 1960 by Amateurs on the West Coast of the United States. The second, A.M.S.A.T., was organised early in 1969 by Amateurs engaged in space research and development in the Washington, D.C., area. A.M.S.A.T's purpose is to foster world-wide Radio Amateur participation in space experiments and in so doing, bring about improved communications for Amateurs and other services alike.

"Many of A.M.S.A.T's members have extensive experience in space telecommunications technology and its membership now includes Amateurs in over twenty countries. The international aspect of Amateur Radio space activities was empasised just three months ago when A.M.S.A.T., in co-operation with the National Aeronautics and Space Administration (N.A.S.A.), arranged for the testing and launch of an Amateur satellite designed and constructed by a group of Radio Amateurs in Australia. Australis OSCAR 5 was placed in orbit in January 1970. . . . A.M.S.A.T. is now planning more advanced Amateur satellites, and has also submitted a proposal to N.A.S.A. to provide two communications experiments to be carried on the ATS-G Applications Technology Satellite.

"Amateur satellite work has been typified by a wide variety of configurations of small and relatively unsophisticated ground stations, such as are operated by Amateurs around the world. This approach has made Amateur satellite work a truly international venture in keeping with the United Nations General Assembly Resolution 1721 (XVI) Part D and 1802 (XVII) Part IV paragraph 3, which expresses the belief that 'communications satellites should be organised on a global basis with non-discriminatory access for all nations'."

In Australia the encouragement given to the Amateur Service by the World Administrative Radio Conference (W.A.R.C.) for the utilisation of space techniques is of special significance, for at present the W.I.A. Project Australis provides one of the very few opportunities for Australians to participate in the use of space for communications. It should be noted that Australis OSCAR 5 was only the second Australian designed and built satellite to "fly", and the first to be constructed primarily of Australian components.

Accordingly, the W.I.A. most strongly urges that it is in the national interest to encourage the development of the Amateur Radio Service, particularly in space.

As is pointed out by A.R.R.L. and A.M.S.A.T., Amateur Radio is far more than hobbyists talking amongst themselves; it is a direct road to self-sustaining communications systems without which no nation can progress, a comment of particular significance in Australia.

3. THE AMATEUR SERVICE FREQUENCY REQUIREMENTS

The W.I.A. recognises the pressures on the frequency spectrum caused by the evergrowing requirements of all services. In the context of the Amateur Service, the density of use in terms of numbers of actual stations operating regularly (or even irregularly) within a specific allocation is no measure of the importance of the allocation to the service—at least in the v.h.f. and higher bands, for, at these frequencies experiments using broad frequency spectrum are regularly used. (For example, Amateur t.v. is a feature of Amateur activity.) Almost necessarily, in many cases these are group activities and in the Institute's view should be encouraged.

The utilisation of bands higher than 144-148 MHz. for space communications will undoubtedly encourage greater utilisation of these bands by Amateurs generally.

This incentive to use higher frequencies will in turn be encouraged by the increasing availability of suitable low cost components for use by Amateurs at these higher frequencies.

Whilst the W.I.A. does not seek any increase in the existing allocations, it does not believe that there should be, on the other hand, any curtailment of these allocations.

4. SPACE USAGE BY THE AMATEUR SERVICE

Footnote 284A of the Radio Regulations 1959 states: "In the band 144-146 Mc/s., artificial satellites may be used by the Amateur Service."

In the W.I.A's view the concept of the Amateur Service is certainly broad enough to include such use. The definition of the service adopted by the Regulations certainly does not imply any restriction on this sort of use. However, the existence of the footnote has been thought to imply that such use is not permitted on other bands.

In fact Australis OSCAR 5 transmitted on a frequency of 29.450 MHz.; OSCAR 4 transmitted on a frequency of 431.935 MHz. These transmissions were permitted under Regulation 135 which permits the use of any frequency if the use does not result in interference. There is, therefore, precedent for the use of frequencies outside the band 144-146 MHz. for Amateur satellite use.

The following bands are exclusively allocated to the Amateur Service on a world-wide basis: 7.0-7.1 MHz., 14.0-14.35 MHz., 21.0-21.45 MHz., 28.0-29.7 MHz., 144.0-146.0 MHz.

The Radio Regulations of the I.T.U. provide for shared use by Amateurs of other bands throughout the spectrum from 1.8 MHz. to 22.0 GHz.

In relation to the exclusive bands, Amateurs have the potential of interfering only with other Amateurs. Most of the exclusive allocations are at lower frequencies. Even though propagation characteristics at these frequencies are well known for terrestrial communication, only limited experiments have been conducted at these frequencies using transmitters in space. Satellites operating at these frequencies will provide a valuable tool for further research into ionospheric ducting, absorption, antipodal propagation, long delay echoes, etc. The Amateur Service, with hundreds of thousands of experienced Radio operators in every part of the world is particularly well equipped to gather this sort of information. The results of this type of investigation are, of course, of universal significance.

By joint Docket No. 18294, the A.R.R.L. and A.M.S.A.T. have commented to the Federal Communications Commission:

"With respect to the exclusive world-wide Amateur bands, A.R.R.L. and A.M.S.A.T. urge **that no limitation be imposed by the forthcoming W.A.R.C. for space operations.** Such a policy will provide each administration with the greatest possible flexibility to encourage or limit Amateur use and development."

The W.I.A. adopts this suggestion and commends it to the Australian Administration.

5. THE PROBLEM OF SHARED BANDS

Certain terrestrial experiments (such as moon bounce on the 70 centimetre band and higher allocations utilising high power) and certain fixed installations such as beacons and repeaters and communications through satellites could conceivably present special problems in shared bands. Interference from normal Amateur terrestrial use, even using broad band techniques for point to point communication, present no special problem, as in fact interference from the Amateur Service has not presented difficulties in the past and can in any event be easily controlled.

Up-link communications from an Amateur station transmitting to a satellite in the Amateur Service should, the W.I.A. contends, be permitted in any Amateur band regardless of whether it is shared, providing the terrestrial stations' transmissions are in accordance with the Regulations of the country in which it is located.

However, in relation to the utilisation of the existing shared bands for down-links and the other special requirements of the Amateur Service mentioned above which, it is admitted, could conceivably present special problems, the W.I.A. contends that these problems would be removed, if within the shared bands, an exclusive allocation was granted to the Amateur Service. Such a course would seem to offer the best solution to the Amateur Service's requirements of wide spectrum for ordinary use, which is easily controlled, and its requirements for specialised experiments that appear to inherently present administrations with a problem of possible interference with other services having higher priority. In making this suggestion and in relation to the Institute's additional proposal for space usage on shared bands, it should be pointed out that the possibility of interference from Amateur satellites is, in fact, remote.

OSCAR 4, launched on 21st December, 1965, into a highly elliptical, 28 degrees synchronous transfer orbit contained a 3-watt transmitter operating on 431.935 MHz. There are no known reports of interference to the radio-location service from this transmitter.

It should also be borne in mind that it is unlikely that the terrestrial antennas used in the radio-location and radio navigation services would be aimed at an Amateur satellite. These antennas are generally of the scanning or rotating type, the main lobe of which would be, at worst, only briefly exposed to satellite energy; the narrow beamwidths of these antennas also tend to minimise the exposure time.

Having regard to the already envisaged utilisation of Amateur satellites for television experiments an exclusive allocation at 70 centimetres of 10 MHz. would appear to be essential. **The W.I.A. accordingly strongly recommends the allocation of exclusive segments within the Amateur Service's shared bands.**

6. AN ADDITIONAL PROPOSAL

Even if the forgoing primary submission of the W.I.A. finds favour, it is considered that an additional utilisation of shared bands should be permitted for space communications, though it is recognised that reasonable means must be provided to provide compliance with the priorities applicable to each band should harmful interference occur. The feasibility of reliable telecommanding a shift in carrier frequency, a reduction in power or a change in the type of emission as well as the ceasing of emission altogether was demonstrated by the Australis OSCAR 5 experiments in January and February 1970. The transmitter in the ten metre band was turned on and off to operate on a regular week-end schedule.

(Continued on Page 25)

An Integrated Circuit One Watt Audio Amplifier

J. REYNOLDS, VK3ZMU*

The amplifier described will deliver one watt r.m.s. audio power into a capacitively coupled 8 ohm speaker, using a 12v. supply. Maximum power to a 16 ohm speaker is approximately one half watt at 12v. supply, or one watt at 16v. The frequency response may be made very wide for hi-fi use or tailored for communication purposes. Gain of the amplifier is adjustable so that full output may be obtained for input voltages in the range 15 mV. to 200 mV. r.m.s.

The input circuit uses a common emitter CR coupled transistor amplifier with negative feedback. This is coupled to a Motorola integrated circuit type MC1454G which raises the power level to one watt. Because of the small value electrolytic capacitors required, capability of 12v. operation and gain adjustment facility, this circuit has proved to be more useful in many Amateur applications than circuits using the less expensive TAA300.

THE CIRCUIT

Fig. 1 shows the circuit of the complete amplifier. Audio input is coupled to the base of the transistor amplifier through C1, a 0.22 μF. polyester capacitor. A.c. negative feedback results from R4 and the unbypassed portion of VR1 in the emitter circuit. By varying the unbypassed portion of VR1, gain can be controlled without disturbing the d.c. bias conditions. R4 is necessary to maintain a high input impedance.

For the ME1001 transistor, the input impedance is about 8K ohms with VR1 fully bypassed and about 35K ohms with no bypassing. A high input impedance is necessary because C1, in series with the input impedance of the stage, forms a high pass filter and thus determines low frequency response. Also, if the emitter was fully bypassed, a high impedance driving source would be required to reduce distortion due to non-linearity of the transfer conductance. This is an undesirable restriction.

The gain of the stage may be varied between 1 and 12 by adjustment of VR1. The amplified signal is capacitively coupled from the collector load resistor (2.7K ohms) to the input of the integrated circuit. C4 and R3 (in parallel with the input impedance of the IC) form a low pass filter and thus determine the high frequency response of the amplifier. The input impedance of the IC is approximately 10K ohms. With C4 equal to 0.02 μF., a bandwidth of 4 KHz. is obtained. This may be increased to 13 KHz. by reducing C4 to 0.002 μF.

The circuit of the IC is shown in Fig. 2. The gain of the IC is controlled and stabilised against temperature and component variations by a conventional method adopted with differential input operational amplifiers. With these amplifiers the differential (emitter coupled) transistors act in antiphase, that is, one inverts the input and the other is non inverting. The gain of the op. amp. will stabilise when the inverting and non-inverting inputs are of equal magnitude.

If one input is fed with the signal and the other is connected to the output via a voltage divider of, say, 10:1, the input voltages will not be equal until the output voltage is 10 times the input voltage. Thus by fixing one resistor in the divider and varying the other the amplifier gain can be varied.

In the MC1454G these resistors are internal. The fixed resistor connected to the output is 10K ohms and goes to the non-inverting input. From the non-inverting input there is a selection of shunting resistors to a.c. ground. By varying the combination of resistors by-passed, the gain of the IC can be adjusted to the discrete values of 10, 18 or 36. In this design a gain of 18 was selected as the best compromise between gain and distortion.

The output stage is two Darlington pairs in conventional configuration. Output power is capacitively coupled to a speaker via C9, a 100 μF. 16 v.w. electrolytic capacitor. The value of C9 also effects the low frequency response of the amplifier, however with the value of C1 specified, the effect of C1 predominates.

The transistors in this integrated circuit exhibit considerable gain up to v.h.f. To avoid v.h.f. instability, CR stabilising networks (0.04 μF. in series with 10 ohms) are connected from pins 9 and 10 to ground. C10 shown in the circuit diagram acts as a reservoir capacitor to supply the peak current demands of the amplifier. This is only necessary when the amplifier is used

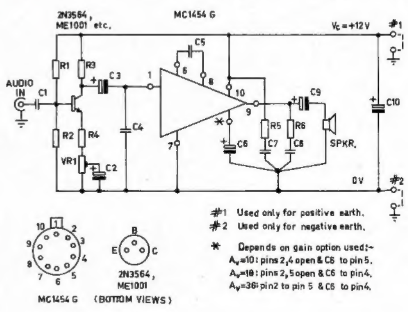


FIG. 1—I.C. AUDIO AMPLIFIER CIRCUIT.

R1—100K ohms.
R2—47K ohms.
R3—2.7K ohms.
R4—120 ohms.
R5, R6—10 ohms.
VR1—2K ohms.
C1—0.22 μF.
C2—50 μF., 10 v.w.
C3—5 μF., 25 v.w.
C4—see text.
C5—39 pF.
C6—50 μF., 10 v.w.
C7, C8—0.04 μF.
C9—100 μF.
C10—100-1,000 μF. (if required).

* 4 Balmoral Avenue, Kew, Vic., 3101.

with a poorly regulated power supply or flat battery. Provision for this capacitor has not been made on the printed circuit board.

PERFORMANCE

Fig. 4 shows the measured frequency response of the amplifier. The effect of gain adjustment on the low frequency response can be seen. The high frequency response falls at 20 dB. per decade. The slope of this roll-off can be increased to 40 dB. per decade by connecting a suitable capacitor from pin 6 to ground. Suggested values are 0.01 μF. for a bandwidth of 3.5 KHz. and 0.002 μF. for a bandwidth of 13 KHz.

Fig. 3 shows total harmonic distortion plotted against power output.

Typical performance figures are:

Nominal supply voltage: 12v.

Bandwidth:
- 120 Hz.-13 KHz. (min. gain, C4 0.005 μF.)
- 170 Hz.-13 KHz. (max. gain, C4 0.005 μF.)
- 160 Hz.-4.5 KHz. (max. gain, C4 0.02 μF.)

Sensitivity: 14 mV. r.m.s. input required to produce 1w. r.m.s. output power into an 8-ohm speaker.

Distortion: less than 0.8% between 60 mW. and 0.8 W.; less than 2% between zero and 1 W.

Operating supply voltage: 6-13.5v. (more than 100 mW., 8 ohms); 7-16v. (more than 100 mW., 16 ohms).

Zero signal current drain: less than 20 mA.

Input impedance: 8K ohms (max. gain); 35K ohms (min. gain).

Maximum power output: 1.2 W. (with heat sink).

CONSTRUCTION

The circuit is constructed on a 4 cm. x 8 cm. fibre glass printed circuit board. VR1 is a miniature pre-set potentiometer. Provision has been made for either positive or negative earth, as selected by straps.

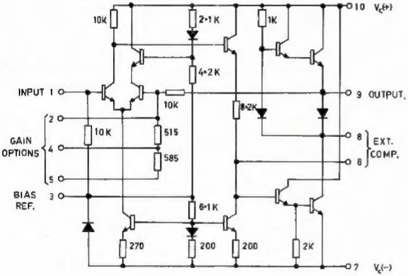


FIG. 2 — SCHEMATIC OF MC1454G AUDIO I.C.

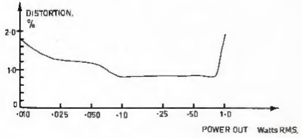


FIG. 3 — I.C. AUDIO AMPLIFIER : DISTORTION.

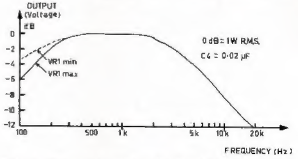


FIG. 4 — I.C. AUDIO AMPLIFIER: FREQUENCY RESPONSE.

DIDDLY DAH DIT

Further experience with the IC Keyer described recently in "A.R." shows that insufficient filtering in an a.c. to d.c. supply has the effect of distorting the leading edge of the timing pulses. Hum, together with poor power supply regulation causes occasional errors at the start of a dash sequence, making the first dash sometimes appear as a dot! Providing the at-rest d.c. supply voltage is at least 3 volts, a drop of ½ volt is not likely to cause any problem. A simple zener regulated supply capable of 80 mA. is therefore satisfactory. Providing a large value capacitor is used after a dropping resistor, there is no reason why a smallish resistor cannot be used in the supply line to "trim" the d.c. supply to the design centre value of 3½ volts.

There have been some reports of r.f. on the keying line causing a continuous key-down condition. This can be minimised by using r.f. chokes in the keying lines; by normal shielding and bypass procedures; and by modification of the keyer to add a 1 uF. tantalum 3½ volt working capacitor between the base of the transistor switch and chassis. This will also serve (with the 1K feed resistor) to integrate the switching pulses to sawtooth shape, which seems to provide a slightly more acceptable keying characteristic. The capacitor should not be less than 0.5 uF. if hum spikes on the keying pulses are to be eliminated.

Contrary to some opinions, the keyer does produce dashes which are self-completing, but not all dots are self completing. The first and last dots in a dot sequence can be shortened by premature paddle movement—not so the dashes. Recognition of this feature helps to know how to handle the paddle so as to send error-free (almost) auto Morse. By increasing the resistance of the speed control potentiometer the "speed" can be lowered and the self completing dash feature demonstrated.

Having tried both breadboard and printed board construction, it is clear that the printed board method is by far the best. If anyone needs a board, similar to the one used by "QST," I can probably arrange supply of a commercially made board at cost on request. At last quote, $1 plus postage.

—Col Harvey, VK1AU

Modifications to the FL200B Yaesu Musen Transmitter

R. D. CHAMPNESS,* VK3UG

Since obtaining this transmitter about 3½ years ago the author has learnt much about the art of SSB and in particular about this particular variety of transmitter. The modifications described are a mixture of necessities and personal choices.

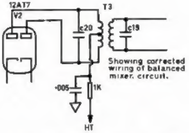
THE lay-out of the audio input from the microphone socket to the grid of the microphone pre-amplifier is quite poor. The mic. socket is right alongside the mains on-off switch and the whole of the audio input lead of about 4 inches is unshielded. In my transmitter this resulted in hum modulation of my signal. To overcome this, the lead was shielded and a shield tube was made out of tinplate to go completely over the mic. socket, which cured this fault.

It is most disconcerting on vox operation to hear the relays clanking in and out, and as well, it meant that the vox had to be desensitised as the noise of the relays operating caused the transmitter to cut in and out of operation. To overcome this fault I rubber-mounted the two relays. The one in the p.a. cage I mounted on a grommet which fitted into an enlarged hole in the side of the cage. For the relay on the rear apron of the chassis, I cut small rubber washers which were fitted on both sides of the chassis wall. The original screw would not fit (too short) so a couple of nuts were soldered to the relay and some longer screws used to mount the relay. By doing this, the noise of relays was considerably reduced, so making vox operation easier.

I had much trouble on c.w. with the key contacts fouling up. This was so bad that I had to clean the contacts after every QSO, and boy that should not be necessary, and is a sign of rather poor design. The reason for this poor performance lies in the fact that when the key is depressed it shorts out some of the grid blocking bias system, which is a very effective method of keying, but the key in this case directly shorts out C43, C58, C67 and C98, which means the key discharges these capacitors in microseconds from a voltage of about —120 volts to zero. This adds up to 0.065 μF.

To reduce this sparking and fouling of the key contacts two 1K resistors are fitted in series with the capacitors in a particular way. One resistor is fitted in the vertical line at the extreme right of the circuit and the other is fitted in the bias line immediately above the caption "V8 12BY7A" on the circuit. By inserting these two resistors the operation of the keying circuit is unaffected but the peak keying current across the key contacts is reduced to 300 mA. and continuous key down current is 8 mA. The value of these resistors is not critical but I would not go below the value I used.

I fitted these resistors, one on the tag strip by the p.a. tube bases, there is a spare lug. The white wire is the lead that is cut to fit the resistor. The other resistor is fitted near the 6CB6 V7. Once again there is a spare lug. There are three white wires with blue traces. The one coming from the centre part of the transmitter chassis is broken to fit the resistor.



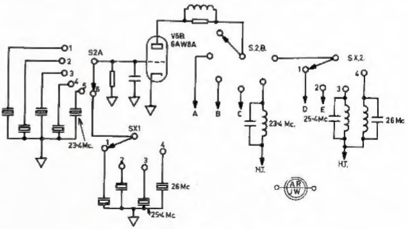
Showing corrected wiring of balanced mixer circuit.

I had trouble with vox and keying circuit giving unreliable operation and traced this to R31, a 1 watt 50K resistor. This resistor had succumbed to its overload so two 82K ohm 1 watt resistors in parallel were fitted, making this section much more reliable. The 50K, or 47K as it was marked, was dissipating nearly two watts. Bad design I feel.

Should you ever burn out a 6BM8 voltage regulator consider fitting a 6GV8 as it has a much higher heater-cathode rating. The 6BM8 has only 100 volts rating and in the voltage regulator it has 150 volts between these two elements. See my article on voltage regulators in "A.R.," Dec. 1969.

Much to my surprise, one day I observed the 12BY7A driver glowing red hot. I immediately thought that something was wrong and started to delve into the works, but on going through the valve voltage chart I found all voltages to be normal. However, when I checked the ratings of the valve I found that in this circuit it is being overrun by about 60%. The screen voltage, for instance, is 280 volts, whereas data on the valve indicates a maximum of 190 volts. I did quite a bit of experimenting about this stage, but found that it worked best with the circuit as is. The valves must be rugged as I haven't blown one yet. I can't say I am happy with the valve being overrun like this, but it seems to keep going quite okay.

This transmitter has rather limited coverage of 10 metres, only going from 27.9 to 29.1 MHz. To overcome this I have thought of fitting an extra switch to bring in other crystals when the band switch gets to position 10B. The 10A position could be used for the 11 metre (26.96 to 27.23 MHz.) band. As per accompanying diagram, at least another two h.f. bands would be achieved with little problem. The switch could be fitted on the front panel in much the same way as done for the



A—Original 40 metre tuned circuit.
B— " 20 " " "
C— " 15 " " "
D— " 10A " " "
E— " 10B " " "

S2 will now read: 80-40-20-15-11-10. SX1 will read 10A, 10B, 10C, 10D, so covering all 10 metres. In the plate circuit of V6A (6AW8A) the wiring would be altered as for S2b and SX2, but the tuned circuits would tune for 11 metres 32.4 MHz., 10 metres C 34.4 MHz., and 10 metres D 35 MHz.

* 24 O'Dowds Rd., Warragul, Vic., 3820.

FT200. I have not done this particular mod., but am thinking about doing it.

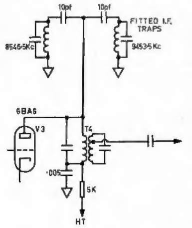
The tuning of the rig on 80 metres in particular, to me, was unsatisfactory; the loading capacitor was at maximum capacity and yet the loading capacitor seemed to need more capacity. I took off the bottom cover of the cage and found I could fit an extra loading capacitor to the 80 metre circuit. I fitted an extra 330 pF. to the contact shown on switch S2F nearest the bridged 10 metre tank coil contacts on the circuit, or if you observe looking down into the upturned chassis, the contact to solder to is the one second from the bottom on the side of the wafer nearest the centre of the transmitter chassis.

I also found it desirable to shift the 80 and 40 metre tank coil tappings. I shifted the 80 metre tapping along 4 turns, giving more inductance, and the 40 metre one 2 turns to give more inductance. The loading of the transmitter is now more satisfactory and the r.f. output, particularly on 80 metres, is greatly improved.

Whenever I switched the unit on the transformer would make a bit of a protest as the electrolytic capacitors were charged up. To overcome this, I fitted a CZ11A thermistor in series with the transformer. The transformer protest ceased, the diodes had less peak current to handle, and the fuse was able to be reduced to 2 amps. very comfortably instead of the 3 amps. originally. It should be possible to run even as light as 1.5 amps.

There are a couple of circuit drawing errors I have found and these I have shown in corrected form in a couple of small diagrams. One concerns the balanced mixer V2 and the other the plate circuit of V6A. There are a few minor differences in various FL200 circuits, so some of the things I have drawn to your attention may not even be in your set, or some of the mods., for all I know, may be in the set. Thus it is best that you peruse your set before doing anything to it.

I have fitted three other traps to the transmitter in addition to the ones already fitted. In the plate circuit of the 6BA6 9 MHz. i.f. amplifier, I fitted



traps to reduce the crystal oscillator frequencies of 8546.5 KHz. and 9453.5 KHz. I'm not really sure how effective these have proved to be as I have not a general coverage receiver to check the suppression of these frequencies in the i.f. amplifier. These can show up as spots 453.5 KHz. away from the desired output frequency of the transmitter.

I was troubled with spurious spots on 7 MHz. and I know for a fact mine is not the only one like this. What I did was to fit a 6.8 MHz. trap in series with LT3 and by careful tuning using a receiver tuned to 6.8 MHz. I was able to reduce this particular spot. This one is caused by the second harmonic of the 3.4 MHz. crystal oscillator on 40 metres. Fred VK3YS suggested this particular trap.

The traps are tuned to the following frequencies: LT1 6.8 MHz., LT2 9 MHz., LT3 9 MHz. LT3 is not mentioned in the alignment data of the transmitter at all. I found that the method outlined in the alignment data did not give very accurate alignment of the traps and I did them the following way. On 14 MHz. I tuned up the transmitter on 14.250. I then ran it on net with full carrier inserted and tuned my receiver to 14.150. You will then find a small carrier which can be nulled out by adjustment of LT2 and LT3. LT3 is under the chassis.

The 9 MHz. i.f. is heterodyned with a 10.4 MHz. crystal to give 19.4 MHz. which is then heterodyned with, say, the v.f.o. at 5.15 MHz. to give 19.4 — 5.15, giving 14.250. But the weak 9 MHz. signal in the plate circuit can also beat with 5.15 MHz. and give 9 + 5.15 = 14.15 MHz. So it can be seen why these traps are in there.

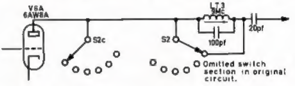
To adjust the 6.8 MHz. traps get hold of a receiver than can tune 6.8 MHz. and set the transmitter up on 40 and then tune in the net position of the transmitter LT1 for least 6.8 MHz. signal in the receiver. Also, if you fit the additional 6.8 MHz. trap I fitted, adjust this for minimum signal. The rest of the transmitter tuning is more or less as per book.

I would suggest that the balanced modulator be tuned up listening on a receiver to the transmitted frequency. There will be a small whistle if the balanced modulator is not quite balanced. Adjust the trimmer and pot alternatively for minimum whistle. It should be possible to virtually eliminate the carrier altogether and all you will be left with will be some mushy 50 and 100 cycle sounds and their harmonics.

The Yaesu Musen transmitters are renowned for their excellent carrier suppression. I doubt that even the so-called Rolls Royce of s.s.b. gear, the Collins, can beat them on this score. I purposely have not given data on the coils used in the traps but suggest you follow the general style of the existing traps in the unit.

I felt that the transmitter was not complete without some additional metering, such as the screen voltage, screen current of the final, a.l.c. operation, and p.a. h.t. voltage. A tx monitor, as I called it, was built which consisted of a 5-position switch, a few resistors and a 1 mA. meter. The actual construction and circuit details can be seen in "A.R.," Dec. 1969, in the article "Sideband the Expensive Way (How to avoid it)". The miniature 5-pin socket was mounted on the rear apron of the chassis alongside the bias pot where the extension a.c. socket was mounted.

In conclusion, I might comment that I have learnt a great deal about sideband from working on this and one or



two other sideband rigs and in general have found it most educational. The modifications I have done won't upset your re-sale value as there is very little sign of anything having been done to the set, certainly nothing externally, although no sensible modification should cause any deterioration in the value of the rig, possibly the reverse. Do not throw the old cliche at me that "to do any alterations to a rig would spoil the re-sale of it". The re-sale of any rig is not high, so why not have it working as it should, and better, then you won't want to sell it.

Have fun with the rig, I have. It is not perfect, but then what rig is, and if it was, we wouldn't learn very much about it because nothing would go wrong, and Murphy's Law has not been disproved yet!!!

THE "M.C.M." OR MOVING COIL METER

K. A. KIMBERLEY, VK2PY*

To most radio enthusiasts the ubiquitous moving coil meter (M.C.M.) is a standard item around the workshop. Useful as it is, some of us tend to accept it at face value without ever wondering how or why it works The purpose of this article is not to engage in a erudite discussion but rather to present the basic principles as simply as possible

THE operating principle of all meters is fundamentally similar in that the quantity to be measured is converted into a mechanical force capable of moving an indicating system.

There are many types of meters manufactured, each with its own special characteristics, thus making some types more suitable for some applications than others Some that come to mind are:—

(1) Moving coil (M.C.M.).
(2) Moving iron.
(3) Electrostatic.
(4) Hot wire, etc.

However, for this article I will confine myself to the moving coil meter as it is the most commonly used type in the electronics game

Some of us know it as the "D'Arsonval" and it consists essentially of a coil of wire suspended within the field of a permanent magnet. An indicator attached to the coil points to a numbered scale.

Direct current, on passing through the coil, produces a flux field which acts with that of the magnet to produce a physical movement. As will be explained later, this movement is proportional to the current flow, hence the scale may be directly calibrated in terms of current, etc.

So much for the intro., now to detail the various parts of the M.C.M.

MAGNET AND POLE PIECES

Pre-war meters, as well as today's cheaper types, used a conventional hardened steel horseshoe magnet. These were reasonably satisfactory due to the care taken in the aging process.

As one would expect, WW2 saw the invention and development of many exotic alloys. One such was "Alnico" which contains aluminium, nickel, cobalt, steel and copper. Alnico has some exceptional magnetic properties, among which are:

(1) Magnetic susceptibility (π_x).
(2) High retentivity (B_R).
(3) High coercive force (H_c).

The above refer to the amount of magnetism resulting from a given input and the ability to retain it over a long period under normal conditions.

Mechanically it is a hard brittle crystalline metal and is extremely difficult to machine, and for this reason alnico is generally cast. Finishing is normally confined to grinding.

Iron pole pieces are attached to the magnet and are so shaped as to leave a circular air gap in which the coil is suspended A soft iron core is fitted into the centre of the gap, leaving a cylindrical space in which the coil moves on its axis.

The magnetic lines of force are now radial to the centre of the soft iron core. Ideally all of the lines of force should be of the same length and hence the field would be of uniform intensity. However, this is not always so and is caused by the cylindrical walls not being perfectly co-axial. Imperfections such as high and/or low spots will also distort the field.

The aberations mentioned above are the major causes of scale non-linearity.

A slotted triangular shaped piece of ferrous metal is sometimes fitted across portion of the air gap to provide a means of adjusting the flux density. This is called a magnetic shunt and is used to adjust the final sensitivity of the meter movement. It may also be used as a means to compensate for magnet aging

COIL

In a practical meter this consists of many turns of fine copper wire wound on a lightweight former. For a given magnet assembly the number of turns governs the sensitivity in terms of current and hence voltage.

That is, the 1 mA.-100 ohm milliammeter, which is probably one of the most commonly used meters in Australia, would need, as per Ohm's Law, 0.1v. (100 mV.) for full scale deflection (f.s.d.).

Now if we double the number of turns, then 0.5 mA. will be required for f.s.d. Now the d.c. resistance will then be increased to more than double (that sounds Irish, but nevertheless is true). However, let us assume that the resistance has been in fact doubled, we will find that 0.1v. will still be required for f.s.d.

Keeping the original number of turns but increasing the diameter of the wire so that the resistance now is 50 ohms, gives a 1 mA.-50 ohm movement which corresponds to a 50 mV. f.s.d. The 1 mA. 50 mV. meter will in some applications give a higher reading than, say, a 100 microamp. 1,000 ohm meter. Strange isn't it.

Whilst discussing the coil it should be mentioned that the coil former can be made to influence the meter characteristics. Nowdays aluminium is generally used and so arranged that it may or may not form a closed loop. The closed loop principle is used to dampen the movement of the coil, thus preventing overswing and oscillation of the pointer. Obviously this effect is caused by the well known "Eddy Current" phenomenon

As the coil is normally wound with copper, its temperature co-efficient of resistance will be positive (p.t.c.). This would be of little consequence if the meter shunts were also of copper. However, this would be rather impractical. In past years coils were sometimes wound with copper to give a sensitivity of say 20 mV. f.s.d. and then the copper resistance "swamped" by adding a zero temp. co-efficient wire wound resistor to give an overall f.s.d. of 100 mV. Thus reducing the final t.c. to 20% of copper.

Modern practice uses a n.t.c. resistor (thermistor) and may be so arranged as to completely cancel out the p.t.c. of the copper coil.

THE SUSPENSION SYSTEM

The two most common types are:—

(1) The pivot and bearing,
(2) Taut band.

In the first type mentioned a hardened steel pin (pivot pin) is attached to the centre of the top and bottom horizontals of the coil. This assembly is then fitted into a housing containing jewelled bearings. These bearings may either be glass or sapphire (etc.), depending upon the ultimate meter quality required (a la watches).

Whilst the bearings are only tightened to a pressure of a few inch-pounds, the actual force applied to the pivot pins is quite considerable. This accounts for the seemingly high rate of wear in the cheaper class of meter.

A top and bottom coiled hair spring completes the above suspension system.

In the taut band system a fine flexible wire is attached to the coil where the pivot pin would normally be. These wires are then anchored and tensioned so that the coil is mounted in the desired position

As the taut band contributes little in the way of friction, it is almost universally used in galvanometers and high class instruments.

In both systems the hair spring or torsion wire (taut band) perform the same functions:

(1) Current connections to the coil.
(2) Provides a counter force against which the rotational force acts
(3) Supplies the return force to reset the meter to zero.

THE INDICATOR

Many systems are used to provide the analogue readout from meters, the more common being:—

(1) Pointer,
(2) Light beam,
(3) Vane.

*2, Nicol Street, Lakemba, N.S.W., 2195.

The pointer is usually of a light non-ferrous material (aluminium, etc.) and may be either a spade end or knife edge configuration. The spade end type of pointer is normally used on the more robust and/or single scale meters, whilst the knife edge variety are used on the multi-scaled meter.

The use of a mirror reflector behind the pointer helps to eliminate the parallex error, and consequently is a standard feature on the better class of instrument.

Naturally a longer pointer produces greater resolution than a shorter one, hence it is wise to use the largest sized meter possible. However, a limit is reached when mechanical and weight problems make any further increase in size uneconomic.

The "light beam system" overcomes these problems and works as follows:—

A small mirror, or prism, is attached to the coil system. A light source is beamed at it via a lens system and the reflection is focussed onto a scale some distance away.

In some very special applications, distance in the order of tens of feet are used. Where space is at a premium a second mirror is introduced, thus forming a reflex system. Sensitivities of 10 picoamperes per mm. for 1 metre throw are typical.

Vane type indicators are used for special applications such as industrial controllers, recorders, speedos, etc. The vane is usually a quadrant of light-weight material and is sometimes connected to the coil system via a gear arrangement. As this quadrant is moved it either covers or uncovers the activating system which may be air, light, magnetism or electrical.

COUNTER WEIGHTS

These are usually fitted to the lower end of the indicator and are used for balancing purposes. This feature enables the meter to be used in any position without impairing its accuracy unduly. Cushioned stops are used to prevent excessive overtravel.

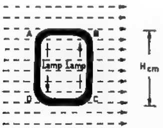


FIG.1. ELEVATION VIEW.

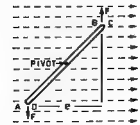


FIG.2. PLAN VIEW.

Whilst the foregoing just about concludes the basic discussion on the principle of meter construction, a few further words are required covering useages.

THE CURRENT METER

The "D'Arsonval" meter may be used to measure such parameters as voltage, capacitance, inductance, etc. However, as it is basically a current operated device, my initial discussion will be on the ammeter.

Figs. 1 and 2 show the elevation and plan view, respectively, of a rectangular coil mounted vertically in a uniform magnetic flux field. The flux is horizontal and goes from left to right.

Suppose it has a strength of H lines per sq. cm., the coil N turns and the current through it I amperes.

In the vertical side of the coil there are N conductors of h cm. length carrying I amperes at 90° to the flux H lines per cm. square.

Therefore the force F on each side of the coil:

$$F \text{ (dynes)} = \frac{HNIh}{10}$$

The plan view shows the direction of these forces which form a couple. Now if e cm. is the distance between the lines of action, the torque will then be equal to Fe.

As H, N and h are fixed in the "force" formula, it may be re-written KI. It was stated earlier that the springs provide a counter force against which "F" acts to move the coil. This counter force is proportional to the deflection angle θ and the spring friction S. When the coil comes to rest the counter force:

$$S\theta = KI$$

$$\therefore I = \frac{S\theta}{K}$$

Hence the deflection is proportional to the current and of course linear.

Meters are manufactured in a wide range of sensitivities and grades. It is usually more economical, in the long run, to purchase a quality meter having the highest possible sensitivity. Shunts for other f.s.d. may be arranged as required.

A shunt, as the name implies, diverts some of the current around the meter, thus extending its range. The resistance required is found

$$R_{SHUNT} = \frac{R_M}{(N - 1)}$$

where R_M is the meter resistance and N the desired extension factor.

Note the voltage drop across the combination will equal the mV. f.s.d. of the meter and hence provides one with an alternative method of calculating R_{SHUNT}.

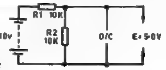


FIG.3.

Total Load $= R1 + R2$
$= 10K\Omega + 10K\Omega$
$= 20K\Omega$
$\therefore I = 0.5$ mA.
$\therefore E\,R1 = 5.0V.$
and $E\,R2 = 5.0V.$

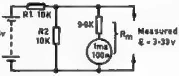


FIG.4.

Total Load $= R1 + \left(\frac{R2 \times Rm}{R2 + Rm}\right)$
$= 10K\Omega + 5K\Omega$
$= 15K\Omega$
$\therefore$ I will now $= 0.666$ mA.
$\therefore E\,R1 = 6.66V.$
and $E\,R2 = 3.33V.$
$\therefore$ Error $= 33\%$

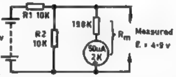


FIG.5.

Total Load $= R1 + \left(\frac{R2 \times Rm}{R2 + Rm}\right)$
$= 10K\Omega + 9.523K\Omega$
$= 19.523K\Omega$
$\therefore I = 0.51$ mA.
$\therefore E\,R1 = 5.1V.$
and $E\,R2 = 4.9V.$
$\therefore$ Error $= 2\%$

The meter resistance may be ascertained by several means, some of which are listed:—

(1) From technical specifications.
(2) Direct measurement by bridge, ohmmeter, etc.
(3) Substitution methods.

If using method 2, ensure that the test potential is such as to cause the meter under test to deflect backwards. This avoids the damaging mechanical shock when the pointer bangs hard over against the stop. The danger of burning out the coil is remote, particularly if the measurement is done quickly.

DIRECT VOLTMETER

The addition of a suitable series resistor enables the "D'Arsonval" meter to measure direct voltage. This resistor is selected so that when the desired full scale voltage is reached the total current through the combination is equal to the basic meter sensitivity. The series resistor is generally known as a range multiplier.

The meter, whilst still performing its original function of measuring current flow, is now calibrated in terms of voltage. The resistance required for a given f.s.d. is calculated using Ohm's Law.

Suppose the meter movement is 1 mA. 100 mV. f.s.d. type and the re-

quired voltage range is 10.0 volts, then multiplier resistor

$$R = E \div I$$
$$= 10 \div 0.001$$
$$= 10{,}000 \text{ ohms}$$

Of course, for low voltage multipliers, the meter resistance should be subtracted otherwise an error will be introduced

When designing voltmeters for use over about 250 volts, it is wise to ensure that both the voltage and power ratings of the multiplier are not exceeded. Voltage co-efficients cause non linear scales whilst excessive power dissipation may permanently damage the resistor.

Sometimes it is easier to classify a metre as so many ohms per volt. The meter in the above example requires 10KΩ, hence 10KΩ ÷ 10v. = 1,000 ohms for each volt. Similarly, a meter of 50 μA. would be 20,000 ohms per volt.

A moving coil meter requires current for its operation, which of course must be supplied from the circuit under test. As a result, the voltage reading obtained is not correct and the error is caused by the added meter current flowing through the source impedance of the circuit under test. This effect may be reduced to a negligible level by using say a 50 μA. (20,000 o.p.v.) meter rather than a 1 mA. (1,000 o.p.v.) type. See Figs. 3, 4 and 5.

ALTERNATING CURRENT

The basic movement may measure a.c. provided a suitable bridge rectifier is used with it. Because of threshold voltage and/or forward non linear resistance effects, it is not normal practice to use shunts when extending the alternating current ranges.

The current transformer, as shown in Fig. 6, is used to extend the basic range. It is possible, but not usual, to extend the range downwards, i.e. more sensitive.

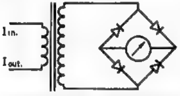


FIG.6. CURRENT TRANSFORMER.

The current transformer may be made with a multitudinous number of turns ratios and is thus very useful. However it introduces problems of its own, such as poor frequency response, added circuit resistance, bulk, cost and worst of all, danger from the possible high voltage across the secondary if it becomes open circuit.

ALTERNATING VOLTAGE

Fig. 7 configuration is used to measure alternating voltage However the D.C.I. through the meter is proportional to the average rather than the R.M.S. voltage. That is,

$$\text{D.C.I.} = \text{R.M.S} \times 1.414 \times 0.636$$
$$= 0.9 \text{ R.M.S.}$$

Obviously the above result must be taken into account when calculating the multiplier resistance.

Example: Alternating voltage range desired, 0-1,000. Basic metre movement 0-1 mA.

$$\therefore \text{Multiplier R} = 1000 \times 0.9 \div 0.001$$
$$= 900{,}000 \text{ ohms.}$$

The above multiplier is 10% lower than that required for direct voltage. Hence for accurate work two sets of multipliers would be required if the same meter was to be used to measure both alternating and direct voltages.

A subterfuge which the author uses is to shunt the meter, on direct voltage, so that the f.s.d. requirement is raised by 10%. On alternating voltage the shunt is switched out of circuit, thus enabling the same multiplier to be used for both conditions.

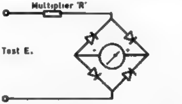


FIG.7. ALTERNATING VOLTAGE.

All of the above assumes that sine waves only are being measured. If steady tone signals (square, triangular waves, etc.) are to be measured then the values of 1.414 and 0.636 would have to be changed accordingly.

As the average and R.M.S. values are constantly changing in speech and music, it should be obvious that moving coil plus rectifier instruments are not really suitable for the measurements of this type.

One final word, note that on low voltages threshold and rectifier voltage drop effects interfere with the scale accuracy and linearity, etc.

Well chaps that about wraps it up for now. I hope you found the article interesting enough even though most of the information presented was rather basic. However, basics are often overlooked, resulting in misleading measurements and thus false conclusions.

☆

Book Review

RADIO AMATEUR'S HANDBOOK

It's that time of the year again. The time to review yet another edition of the book commonly known as the A.R.R.L. Handbook. This time it is the forty-seventh edition of the book which has been published continuously since 1926 and has distributed more than four million copies. But now for the big question. Is this edition of the handbook worth buying?

If you are a newcomer to Amateur Radio, or are even slightly interested, and you do not have a recent copy of this handbook, read no further! Just go straight out and buy a copy. It does not cover everything pertaining to Amateur Radio and it does not always cover those items included in the fullest detail but it comes closer to doing so than any other book available at a reasonable price. For those of you whose copy is a few years old, you also should buy this issue.

Considerable revision has taken place in both the theory and construction sections and experimenters will be delighted not only at the increased coverage of the theory side of semiconductor electronics, but also at the very large increase in the number of solid state construction projects in both h.f. and v.h.f. fields. And, of course, the greatly expanded tables of the latest transistor and diode specifications.

The Portable/Mobile and Antenna chapters have been completely re-written and updated. For the first time treatment has been given to v.h.f. repeater stations and to satellite communications. All in all, a very good edition of the A.R.R.L. Handbook to have in your bookcase or workshop. The only major criticism would be one that unfortunately applies to most publications from the U.S.A and that is the use of many components in the construction projects which are described by little more than their catalogue numbers, which, needless to say, do not apply in Australia

Published by the American Radio Relay League. Review copy supplied by the A.R.R.L. Available from the W.I.A. F.E. Publications Department, P.O. Box 67, East Melbourne, Vic., 3002 Price $5.95.

Construction of Low Loss Co-axial Cable

H. N. SANDFORD, VK4ZT*

It is convenient to use rigid co-axial cable to support feeds in parabolas used on 1296 MHz. and higher

THE difficulty and expense in obtaining suitable low loss co-axial cable prompted the investigation into methods of construction using locally available materials. It was found uneconomical to purchase short lengths of rigid co-ax. as the cost of the associated connectors would be several times that of the cable alone. For example, a 20 ft. length of 7/8" diameter rigid co-ax. is about $70 and fitted with flanges both ends $90. Flanged adaptors with type N connectors are about $27 each, so the total cost of a 20 ft. length with type N connectors would be about $144 or just over double that of a standard length of co-ax. alone. These figures were taken from an American catalogue and, of course, are for high quality components suitable for use to 3 GHz. As a matter of interest, the attenuation of this co-ax. at 1300 MHz. is about 1.6 dB./100 ft., rising to about 3 dB./100 ft. at 3.3 GHz.

COPPER CO-AX. CONSTRUCTION

The first method investigated employed copper pipe available from plumbing suppliers. At the time I could only obtain 3/4" o.d. x 20 gauge and 1/4" o.d. x 20 gauge tubing for the inner conductor. The theoretical impedances and cost (these will only be an indication due to fluctuation in copper prices) for a few combinations are as follows:—

Outer I.D.	Inner O.D.	Zc	SWR	Approx. Cost per ft.
3/4" x 20g.	1/4" x 20g.	59.5	1.18	70c
3/4" x 20g.	5/16" x 20g.	46.2	1.08	75c
3/4" x 18g.	1/4" x 20g.	55.8	1.15	83c
3/4" x 16g.	1/4" x 20g.	54.0	1.08	$1.03

20g. — 0.678"
18g. — 0.654"
16g. — 0.627"

All of the above s.w.r.'s were acceptable for the project as the mismatch loss would be negligible. Various methods may be used to cope with the mismatches or the system could be designed around the nominal impedances. In any case, much of the cheaper flexible solid dielectric co-ax. cable available is no better than this. Type N female connectors were fitted at each end. The cheapest method found was to use a type N female to female connector (UG29B/U, commonly referred to as a "bullet"), cutting the connector in half to provide a transition at each end of the co-ax. It also provides a convenient support for the inner conductor. See Fig. 1.

Carefully cut the body of the connector in two places 1/8" either side

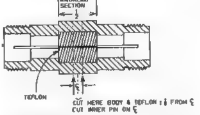


Fig. 1.—UG29B/U Type N Connector showing the position of cuts to make two end adaptors

of the centre so as to remove ¼" from the body. Withdraw the inner conductor and cut exactly in half. The Teflon insert may now be cut off flush with body so when the inner pin is refitted there will be 1/8" protruding from each cut portion of the connector. If a lathe is available, the outer may be parted off.

Prepare the inner copper tubing conductor of the co-ax. by cutting ¼" shorter than the desired length of the outer ¾" pipe. Plug the ends of the inner tube with a neat fitting piece of brass or the shoulders may be filed off a small brass nut. Solder the plug into the ends of the tube and drill out for a neat fit on the centre pin of the connector.

Teflon washers are fitted on the inner conductor at 3 to 5 ft. intervals to support the inner conductor centrally. These may be cut from 1/16" Teflon sheet. The sheet is available from Bearing Suppliers and is very expensive, but the small amount required should cost less than $1. Polystyrene or Polythene would also be suitable.

Teflon or Polythene is best cut using a short piece of either tubing. With a pair of dividers, lightly scribe two circles with diameters of the o.d. of the inner and the i.d. of the outer. File or turn about a 60° angle on the outer end of the ¾" tube to make a sharp edge on the inside circumference. With the ¼" tube, run a 3/8" drill into the end until a sharp edge is produced on the outside circumference. Place the Teflon or Polythene on a smooth hard piece of wood. The washer may now be cut with a sharp blow using the two tubes as cutters. Polystyrene will, of course, require drilling and cutting.

Slide the spacers onto the inner concuctor at the desired spacing. If care is taken, these will be a tight fit on the inner. The outer edge of the spacers should now be filed down slightly so as to slide neatly inside the outer tube without binding.

The two pins should now be soldered into the ends of the inner conductor, taking care to fit the Teflon spacer from the connector beforehand.

The inner surface of the outer tube should be tinned for approximately ¼" in at each end. Solder the body portion with approximately 1/8" of the connector extending into one end of the outer tube. Depending on the gauge of the outer tube, it may be necessary to fit a 1/8" wide strip of shim brass between the body of the connector and the tube, before soldering. 16 gauge tube should provide a neat fit.

Slide the inner conductor carefully into the outer conductor, taking care not to move the spacers. Push right home so the Teflon spacer and pin fit correctly into the end socket already fitted. The other connector body is finally soldered into position, completing the assembly of the co-ax. Use only sufficient heat to solder, and it is a wise precaution to tilt the end being soldered down slightly to prevent any solder running back into the co-ax. The complete assembly is shown in Fig. 2.

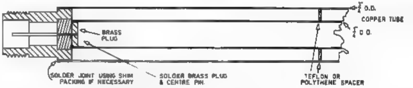


Fig. 2.—Assembly of Type N Connector to Copper Co-ax.

PERFORMANCE

The reflection co-efficient of a 6 ft. length of this co-ax. was measured using a Hewlett-Packard 1415A Time Domain Reflectometer The characteristic impedance was measured at 57.5 ohms, which is slightly lower than calculated and may be due to tolerance of the tubing used. This gives an s.w.r. of 1.15. A copy of the TDR trace is shown in Fig. 3.

The two pronounced dips are due to the capacitive reactance of the two Teflon spacers but only amount to a reflection co-efficient of approximately 2%. It is possible to compensate by cutting a groove in the inner conductor, but in view of the small reflection obtained, this was considered unneces-

* 18 Loch Street, Toowoomba, Qld., 4350.

sary The irregularities in the line are no worse than those observed on a piece of good quality flexible co-ax. The TDR response extends to 2.3 GHz., so this method of construction is probably suitable for narrow band work to at least 3.3 GHz. and possibly higher. Attempts to measure the loss were unsuccessful as this appeared to be less than 0.1 dB. at 1296 MHz.

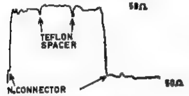


Fig 3.—TDR Response of Copper Line with Type N Connectors.

ALUMINIUM CO-AX. CONSTRUCTION

Tom Norris,† VK4NO, used aluminium tubing and BNC connectors on a similar project. The outer tube consisted of 1" o.d. x 18g., and the inner 3/8" o.d. x 18g. Tapered sections were machined to match the co-ax. dimensions to the BNC connectors. The calculated impedance of this line is 52.6 ohms and the measured impedance using the TDR was 52.8 ohms. The nominal dimensions of the tubing were within 0.001".

Slightly different techniques are required due to the connectors and materials used

where D — i.d. of the outer,

d = o.d. of the inner,

and Zc is the characteristic impedance.

Taper the inner section from this calculated value up to the o.d. of the inner aluminium conductor. A neat hole is bored to fit the BNC pin. The other end is turned to be a neat fit in the inner conductor. The brass section may be tinned to reduce the possibility of electrolytic action. If desired, the tapered section may be a heat shrink fit in the inner, or may be pinned. Assembly is straight-forward.

Fit the tapered sections to the inner conductor after determining the correct length. Solder the pin and Teflon from the modified connector to one end of the inner. Fit one of the outer tapered blocks into one end of outer tube. Slide the inner into the outer tube so the inner protrudes through the end block Solder the unmodified connector to this end of the inner, then mount the connector flange with fixing screws tapped into the block. The other end block may now be fitted. Finally, the body of the remaining connector is screwed into place. If desired, both connectors may be modified to remove the inner pin and Teflon block for easier fitting.

BNC THREADED CHASSIS MOUNTING CONNECTOR

A suggested method of mounting is shown in Fig. 5. The outer tapered aluminium block and the inner tapered brass section is of the same construction as detailed in the preceding section.

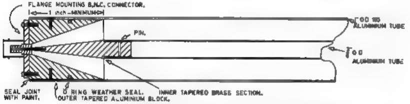


Fig. 4.—Assembly of BNC Flange Mounting Connector to Aluminium Tube

BNC FLANGED CHASSIS MOUNTING CONNECTOR

Refer to Fig. 4 for details of this construction. A slight modification is required to one connector to allow for easier assembly. This involves removing the swaging that retains the Teflon and centre pin.

The outer block is made of aluminium 1" long and turned to fit neatly in the outer tube The inner hole is arranged to fit over the Teflon at the rear of the connector. This will depend on the particular connector used. The inside taper is linear from this hole that fits the connector to nothing at the inner diameter of the outside tube. The inner tapered section is made of brass and the starting diameter of the inner at the rear of the connector may be calculated from the normal formula, Zc = 138 log (D ÷ d), which for 50 ohm co-ax transposes to

$$d = 0.4409 \times D$$

† 210 Hume Street, Toowoomba, Qld., 4350.

Both connectors are modified by removing the swaged retaining section to allow removal of the centre pin and Teflon block for ease of assembly.

The connector may be mounted with an adaptor block tapped to take the connector (3/8" x 32 threads per inch). The normal mounting nut may be used as a locking nut. The adaptor block is attached to the outer aluminium tapered block with tapped mounting screws.

An alternative method would be to solder the mounting nut to a piece of,

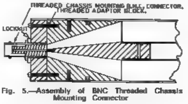


Fig. 5.—Assembly of BNC Threaded Chassis Mounting Connector
(Other details and dimensions as Fig. 4.)

say, 16 gauge brass plate, and screw this to the outer aluminium tapered block—in effect, converting the connector to a flange mounting or, if desired, the connector body could be soldered directly to the plate. The cost of 1 ft. of this co-ax. is in the order of 34 cents.

PERFORMANCE

A copy of the TDR trace of a 6 ft. length of aluminium co-ax. is shown in Fig. 6. The Teflon spacers are evident and the larger transition steps at each end are caused by the BNC connectors which are not as good at these frequencies as the type N connectors. Some of the discontinuity, however, was introduced by the BNC to type N adaptors used at either end for measurement.

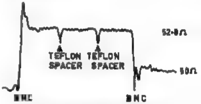


Fig. 6.—TDR Response of Aluminium Line with BNC Connectors

In any case, the steps due to the connectors do not exceed 3 to 4%, and should be satisfactory for use to several GHz. The loss was too low to measure with methods available, being less than 0.1 dB. The measured impedance of 52.8 ohms gives an SWR of 1.056.

WEATHERPROOFING

The copper co-ax. should be suitable for outside use, as it is completely sealed by the waterproof type N connectors.

The cheaper aluminium co-ax. would be more difficult to seal, but probably could be done by sealing the joints with suitable paint. A better method would be to fit O-rings in grooves around the outer tapered block. It would only then be necessary to seal the connector to the block with paint. Alternatively, dry air may be blown into the co-ax. under a slight pressure and allowed to leak out around the joints, thus preventing the ingress of moisture.

JOINING LONG LENGTHS

It is a relatively simple matter to join 18 ft. or 20 ft. stock lengths of tube to produce long low-loss runs. A neat fitting inner plug similar to the end of the inner tapered section can be used to join the inner conductor. The outer copper tube may be joined by sweating a neat fitting outer tube over the butt joint The aluminium outer presents a more difficult problem, but could be joined using a neat fitting sleeve locked in place with lock screws tapped into the sleeve. An O-ring in a groove at each end of the sleeve could be used to provide weather proofing or possibly a smear of "Araldite" or similar adhesive at each end of the sleeve would be satisfactory.

(Continued on Page 15)

THE EFFECTIVE VALUE OF AN ALTERNATING CURRENT

LECTURE NO. 5

C. A. CULLINAN,* VK3AXU

Some knowledge of Calculus is desirable for this Lecture

A direct current d.c.) of electricity is a steady current travelling with time in one direction only, i.e. it is either Positive or Negative and remains such until some action is taken to alter its value or stop it entirely.

An alternating current (a.c.) of electricity is not steady but continually rises, falls and reverses itself, twice becoming zero and twice rising to a maximum, but in opposite directions in one complete cycle of changes.

In a simple alternating current generator, termed an alternator, let us assume that we have two magnets arranged opposite each other, one North and one South with a single loop of wire arranged so that it can be rotated between them.

Also, let us assume for a moment that the two magnets are vertical and that the loop of wire is horizontal.

Let us connect a centre zero ammeter in series with the loop of wire, then start to rotate the loop in a clock-wise direction.

Due to the phenomenom of Induction it will be found that as the loop approaches each of the magnets as it turns 90°, then the ammeter will show that an electric current is flowing in the loop. This will reach a maximum when the loop has turned 90°, i.e. its plane is in the same plane as that of the magnets.

However, as the loop is rotated further the current flowing in the ammeter will decrease and become zero when the loop is at 180°.

Now as the loop continues to rotate the current in the ammeter will be seen to rise, but in the opposite direction until a maximum is reached at 270°. With further rotation the current will fall and zero is reached at 360°. Thus the current twice becomes zero at 0/360° and 180°, and twice becomes a maximum (of opposite polarity) at 90° and 270°. One complete rotation is known as one cycle. The loop of wire is known as an armature. If the armature is rotated at 3,000 revolutions per minute, then it will rotate 50 times each second. 3,000 ÷ 60 = 50.

Therefore we would say that the number of cycles per second is 50. This is known as the frequency of the alternating current.

If speed is 3,600 r.p.m. then the frequency is 60 cycles per second, or if speed is 6,000 r.p.m. then the frequency is 100 cycles per second

From this it will be seen that the frequency of an alternating current is the number of cycles which occur in each second of time.

If the armature is rotated quickly the zero centre ammeter will not be able to follow the rapid alternations of current and its use in this explanation is more hypothetical than practical.

* 6 Adrian Street, Colac, Vic., 3250.

● Continuing the series of lectures by C. A. Cullinan, VK3AXU, at Broadcast Station 3CS for students studying for a P.M.G. Radio Operator's Certificate.

It must be realised that the loop of wire can only be rotated during a finite period of time. If it ceases rotation then there cannot be any current flow as the property of induction will cease too. In our simple alternator the magnets may be permanent magnets or electo-magnets having a constant magnetic field produced by supplying the electro-magnets with Direct Current. Also no matter how fast the loop is rotated it must take some amount of time to complete one revolution or cycle. In actual practice there are limits to the maximum speed of rotation that can be achieved.

where ($2 \pi f t$) is the phase angle of the cycle and is known as θ,

therefore $i = I \sin \theta$.

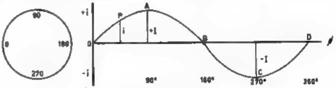
In one complete cycle $\theta = 360°$ and the graph of this equation is shown in Fig. 1.

The curve O A B C D is repeated for each individual cycle and I is the height of the maximum current. The ordinate at any point can be shown as P and the instantaneous current corresponding to any phase θ is i.

It will be seen that the loop O A B is exactly equal in shape but opposite to the loop BCD, therefore the current generates exactly the same amount of power in the positive half of the cycle as it does in the negative half.

Therefore the effective current is the same for each half of the cycle, thus the same for each complete cycle as long as the current continues to flow.

Let us then calculate the effective value of the current for the half cycle O A B.



θ = 360° for 1 complete cycle.

Because of the time taken to make each revolution. the maximum current in one direction, say positive. is then followed by the maximum current in the opposite direction, but because of the time difference between the two maxima neither will cancel the other.

Thus it becomes possible to display the rotation of a single cycle of the loop or armature as a circle

Now this circle can be transferred into a graph, having time shown horizontally and the amplitude of the current shown vertically and the resulting curve will be the well known Sine curve, i.e. let us roll the circle along a straight line and plot the resulting curve (see above diagram).

We desire to find the "effective" or equivalent steady current when the maximum value of one cycle is known.

In an a.c. circuit the power is not proportional to the current itself (since this varies as can be seen from the sine curve), but to the square of the current flowing in a resistance R.

Thus Power = Ri^2.

Let I be the maximum value of current for the cycle and i the instantaneous value at any time t, and f the frequency in cycles per second.

Then i is given by the formula:

$$i = I \sin (2 \pi f t)$$

As mentioned before, at any instant when the phase is θ, then the current is i as shown at P.

We have already said that Power = Ri^2, also that I = sin θ. Therefore the power generated per second of time = Ri^2.

$$= R (I \sin \theta)^2$$

$$= RI^2 \sin^2 \theta.$$

The average value of this power for all values of θ over the entire cycle of 360° is the same as would be generated by the equivalent or effective current, where Ie represents the equivalent or effective current, then the power generated by it is RIe^2 and this must be equal to the **average** of $RI^2 \sin^2 \theta$ over the cycle or half cycle.

In order to find the average value of any quantity over a certain range we integrate it over that range (or sum up all its values over that range) and divide by the total range.

Now the Integral (or sum) over half a cycle (0-180°) = 0 to π, is

$$\int_0^\pi$$

and therefore the average as stated above is

$$\frac{\int_0^\pi}{\pi}$$

The average of this expression for the varying power is therefore,

$$\int_0^\pi \frac{(RI^2 \sin^2 \theta)\ d\theta}{\pi}$$

The $d\theta$ means the difference or differential or part of the angle θ, and as $R = I$ are constants, this becomes,

$$\frac{RI^2}{\pi} \int_0^\pi \sin^2 \theta\ d\theta$$

as stated previously, this is equal to RIe^2, hence,

$$RIe^2 = \frac{RI^2}{\pi} \int_0^\pi \sin^2 \theta\ d\theta$$

Divide by R

$$= Ie^2 = \frac{I^2}{\pi} \int_0^\pi \sin^2 \theta\ d\theta,$$

and to determine the value of the effective current Ie, we must integrate $\int \sin^2 \theta\ d\theta$.

To do this we use the trigonometrical relationship $\cos 2\theta = 1 - 2 \sin^2 \theta$.

Therefore $\sin^2 \theta = \frac{1}{2}(1 - \cos 2\theta)$

therefore $\int \sin^2 \theta\ d\theta$

$$= \tfrac{1}{2} \int (1 - \cos 2\theta)\ d\theta$$
$$= \tfrac{1}{2} \int d\theta - \tfrac{1}{2} \cos 2\theta\ d\theta$$
$$= \tfrac{1}{2}\theta - \tfrac{1}{2} \int \cos 2\theta\ d\theta$$

Now $\frac{1}{2} \int \cos 2\theta\ d\theta$

$$= \tfrac{1}{4} \int 2 \cos 2\theta\ d\theta$$
$$= \tfrac{1}{4} \int \cos 2\theta \,.\, 2\ d\theta$$
$$= \tfrac{1}{4} \int \cos 2\theta \,.\, d\,(2\theta) = \tfrac{1}{4} \sin 2\theta$$

Hence $\int \sin^2 \theta\ d\theta$

$$= \tfrac{1}{2}\theta - \tfrac{1}{4} \sin 2\theta$$
$$= \tfrac{1}{2}(\theta - \tfrac{1}{2} \sin 2\theta).$$

Remember earlier we showed that

$$Ie^2 = \frac{I^2}{\pi} \int_0^\pi \sin^2 \theta\ d\theta$$

therefore Ie^2

$$= \frac{I^2}{2\pi} \Big[\theta - \tfrac{1}{2} \sin 2\theta\Big]_0^\pi$$

$$= \frac{I^2}{2\pi} \Big[(\pi - \tfrac{1}{2} \sin 2\pi) - (0 - \tfrac{1}{2} \sin 0)\Big]$$

$$= \frac{I^2}{2\pi} = (\pi - \tfrac{1}{2} \sin 360^\circ)$$

$$= \frac{I^2}{2\pi}\ (\pi)$$

therefore $Ie^2 = \dfrac{I^2}{2}$

therefore $Ie = \dfrac{I}{\sqrt{2}} = 0.7071.$

Thus the effective value of an alternating current is 0.707 of the maximum current.

Similarly the effective voltage in an a.c. current $Ee = 0.707\ E$, where E is the maximum voltage in the cycle.

Ordinary a.c. voltmeters and ammeters indicate the effective value. (There are special meters which read the peak voltage.)

Thus when reading the voltage or current in an a.c. circuit it must be remembered that this will be the effective value (except where the peak reading meters are used).

Therefore if the effective or average value is known, the peak voltage or current can be calculated readily.

Ie or Ee = 0.707 I or E

therefore Peak value = I ÷ 0.707

= 1.41.

The discussion above has assumed that the a.c. current is the same for both halves of the cycle.

However, this is not true with audio-frequency currents and voltages as found in music and speech.

Therefore the Australian Broadcasting Control Board implies, by regulation, that the difference between the average power as read by a Vu meter and the peak power will be 8 decibels.

Thus in Australia this figure must be used, although other counties may use a different value.

Vu meters used in studios and on professional tape recorders read the average or effective value, whereas the peak reading meters used on some recorders read the peak value. This must be remembered when testing such machines.

When testing a tape recorder with a sine wave, or a broadcasting system, it is necessary to test at normal level and at 8 decibels above this.

In a transmitter the maximum level is that which produces 100% modulation of a sine wave, referred to 1,000 cycles per second. Then the average value of a test signal is set 8 db. below this figure, i.e. 40% modulation.

When dealing with a.c. power systems, a.c. motors and the like, it should be remembered that voltages are quoted on the average figure.

Insulation, valve and solid state devices must be considered in the light of the peak value plus a margin for safety.

Thus a power transformer designed to give 300 volts a.c., each side of a centre-tap, will give 300 volts average or 600 volts across the whole winding. However, the peak or maximum voltage will be 600 × 1.41 = 846 volts.

PROVISIONAL SUNSPOT NUMBERS

APRIL 1970

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	112	16	92
2	94	17	82
3	121	18	86
4	116	19	67
5	120	20	65
6	118	21	64
7	123	22	57
8	147	23	67
9	172	24	80
10	188	25	93
11	183	26	81
12	183	27	88
13	141	28	108
14	134	29	112
15	106	30	116

Mean equals 109.1.

—Swiss Federal Observatory, Zurich.

Construction of Low Loss Co-axial Cable

(Continued from Page 13)

A more complex locking arrangement using a gland at each end could also be devised, but would require considerable machining.

RELATIVE COSTS

These are estimated for 18 ft. lengths and provided only as a guide (Table 1).

An allowance has been made for miscellaneous items, Teflon, etc. It will be seen that aluminium construction is the cheaper, unfortunately involving more effort.

CONCLUSION

It has been shown that satisfactory low-loss rigid co-axial cable can be manufactured at relatively low cost. While the initial cost of the copper co-ax. is higher, only hand tools are required in the construction and is suitable for all weather use. The aluminium co-ax. construction is cheaper and lighter, but more complex, requiring the use of a small lathe and is also more difficult to weatherproof.

It has also been demonstrated that measured values agree closely with calculated values, thus allowing the design to proceed with confidence, especially when measuring equipment is not available.

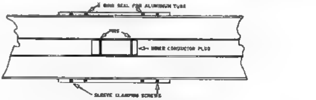


Fig. 7.—Joint for Aluminium Co-ax.
For Copper, inner and outer may be sweated.

Material	Outer	Inner	Cost/ft.	Connector Cost	Zo	Total Cost
Copper	¾" x 20g.	¼" x 20g.	70c	Type N $2.50	58 ohms	$16.00
Copper	¾" x 16g.	¼" x 20g.	$1.03	Type N $2.50	54 ohms	$22.00
Aluminium	1" x 18g.	⅜" x 18g.	34c	BNC $2.25	53 ohms	$9 00

Table 1.—Estimated cost for 18 ft. lengths of co-ax.

"Where Have All Those Good Hams Gone?"

Not a bad question, not such an uncommon one. Especially if you live in certain areas of our VK4 land.. Why **don't** you hear as much of old pro's such as Mick VK4ZAA, Dane VK4ZAX or Tom VK4ZAL, just to think of a few. I have no doubt much the same is asked of many Amateurs in VK3 land.

The answer is simply given, but not as easily understood. The answer—Channel 0.

We, in many areas, particularly VK3 and VK4, certainly know why we are not heard of so often these days. But can any of us give a good sound reason why this has come about.

The practical explanation is simple. Suddenly you have a transmitter only 250 kilocycles away from the bottom of your band. Effective radiated power: 100 kilowatts vision, 20 kilowatts sound. Bad enough, even discouraging!

But combine the complex, varying pulse nature of the vestigal video modulation with a frequency modulated intercarrier, and the result just has to be heard to be believed.

So we tried filters, we tried low cross-modulation converters, we tried a lot. And results were sometimes good. However, it was not good for long. Old t.v.i. himself soon showed. Back to the old drawing board. High pass filters, 52 megacycle oscillators, shielding and just about everything else too! But those t.v. sets just **don't** cut off response at 52 megacycles.

So "t.v.i. reigns, even though transmissions are clean, stable, and in most cases, on quite low power. Officially the verdict is, and we must abide by it, NO 6 metre transmission during Channel 0 programming.

This gives us no evening transmissions at all, unless, at least, after 2300 E.A.S.T. Mornings are available week days and Saturdays to 0900 or so, and Sunday, if lucky, to 1100 hours.

As mentioned earlier, this answers "why" to some questions, but what is the reason.

Possibly one reason is that most of us, myself included, did not realise just how bad things were going to be, when that 2 megacycles of our 6 metre band slipped away.

Another reason, certainly, must be the disappointing lack of consideration which must have been shown towards our Amateur Services, of present and past, by persons in control of frequency allocation.

But whatever the reason, the damage is done. "Fifty to Fifty-two" is gone for good. So have a lot of the old 6 metre Amateurs. Whether we can place any blame on ourselves or others for allowing these circumstances to arise is not at question anymore. It is too late

But, please chaps, never let it happen again. Once part of any Amateur band is gone, it is gone for good

And, sadly enough, on 6 metres, a lot more than 2 megacycles have gone. So have too many good friendships which we looked forward to renewing every DX season.

—J. D. Bisgrove, VK4ZJB/T.

OSCAR 6—THE AUSTRALIAN "BIT"

LES JENKINS, VK3ZBJ*

The OSCAR 6 satellite will, it is hoped, be launched into orbit about the middle of next year. The orbit path will probably be similar to that followed by AUSTRALIS OSCAR 5, a near-polar orbit at a height of about 1,000 miles. This would allow Amateurs in Japan to contact their fellows in eastern Australia and would make trans-Tasman Amateur communications on v.h.f. a regular and reliable fact. Similarly, trans-Atlantic contacts on v.h.f. will become almost routine.

OSCAR 6 will carry two independent communications systems; transponder A (built in Australia) and transponder B (built in Germany). The two transponders are completely different in their operation, so it is important that intending users become acquainted with their operation and with the equipment that will be required to use them. The following description of the VK portion of the payload will enable intending users to prepare themselves well in advance of the launch, so that maximum use may be made of the satellite.

SYSTEM OUTLINE

The basic concept is that of a repeater system. Signals are received by the satellite in the 2 metre band, demodulated and the recovered audio used to modulate the downlink transmitter, which radiates in the 75 cm. band. Several channels are available, each with its own separate receiver i.f. system and transmitter. The inputs for the i.f. amplifiers are derived from a common primary converter.

As the incoming signal is demodulated, it will be obvious that only one mode can be accommodated. The one chosen is f.m., with the specifications being compatible with currently used f.m. "Carphone" type equipment.

Two other sub-systems will be provided—a multi-channel digital command system and a multi-channel telemetry system. These will be shared by all systems on board the spacecraft and will enable either communications transponder to be activated alternately, as well as providing for corrective measures to be exercised in the event of failure of certain spacecraft functions.

The telemetry system will provide some 60 channels, shared by both transponders, the output of which will be r.t.t.y. This will be compatible with normal 850 Hz. shift, 45.5 Baud systems. The downlink frequency for the telemetry, as well as the modulation mode, will depend on which transponder is activated.

CHOICE OF INPUT-OUTPUT BANDS

Some readers may question the choice of input-output frequencies. The choice is based on the following considerations.

1. **Elimination of Mutual Interference.** If the uplink band is 75 cm., then the output from the downlink in the 2 metre band would have harmonics falling in the bandpass of the receiver input circuits. Even if these are well down in amplitude, say, —50 dB., they are still quite large signals and may produce undesirable responses and "birdies" in the receiver system. More importantly, they can de-sensitise the receiver, thus requiring more ground station power to acquire the satellite.

It may be argued that these faults can be rectified by the use of suitable filters and choice of frequencies. However, it seems an unnecessary hardship to impose on the satellite builder if a simpler solution is available.

The case of the wholly "inband" system (i.e. 2 metre/2 metre, or 75 cm./75 cm.) is discarded for the above reasons, and this is supported by experience with ground-based systems. Such operation in the 75 cm. bands is feasable. However, this band is restricted in certain geographical regions and this, on a world basis, poses some problems.

The 2 metre input/75 cm. output system has several advantages. In the first place, it is possible to generate 432 MHz output without producing spurious signals in the 2 metre band. This is accomplished in the VK system by generating at 13.5 MHz. and "doubling all the way". The resulting system allows antenna configurations and subsystem layouts within the satellite to be arranged without regard to input-output coupling.

This coupling between antennae on a small spacecraft is extremely tight if antennae for the same band are used. AO5, for instance, suffered extreme crosstalk between the input and output antennae; so much so, that 10 kW. e.r.p. was required to exercise command! The demonstration model of OSCAR 6 has its antennae intermingled, with no measureable degradation in receiver sensitivity.

2. **Ground Equipment.** From the user's point of view, the ground equipment requirement is the most important aspect of satellite operations. In this respect there is not much difference between systems, with "inband" techniques requiring only one antenna being the most favorable. The most effective use of power, both on the ground and in the spacecraft, favors 75 cm. for the uplink and 2 metres for the downlink. High gain antennae for 75 cm. are small and easily mounted and the larger capture area of 2 metre antennae requires less downlink power for the same result. The higher path loss on 75 cm. is more easily made up with both higher power output and high gain antennae on the ground, whilst lower path loss on 2 metres means less transmitter power required in the satellite.

This argument is certainly in favor of the opposite system. However, when the ground requirements are presented the reader will see that things are not quite so bad after all. Those who tracked AO5 will remember how good a signal they received, and this from 100 mW. of output power. It follows that 100 mW. on the ground into a

* 54 Tennyson St., Highett, Vic., 3190.

receiving antenna would reach the satellite just as well. If a standard f.m. mobile unit with, say, 10 watts of carrier output is used, then the signal into the satellite will be 20 dB. higher than the signal received from AO5. When one takes into account the fact that the receiver in the satellite is an f.m. unit, it follows that a very solid, noise-free signal can be put into it for a very small amount of power on the ground. Let us do some simple arithmetic and see what this all means in terms of output power.

The satellite receivers have the following characteristics:—

Input frequency: 144-146 MHz.
I.f. bandwidth (—40 dB.): 50 KHz.
Input noise figure: 0.8 dB.
6 dB. quieting: 0.07 microvolt (50 ohm).
20 dB. quieting: 0.18 microvolt (—124 dbm.).

To a first approximation, we can calculate the path loss as:—

$L = 37 + 20 \log F + 20 \log D$

where F is frequency in MHz.
D is distance in miles.

If we put $F = 150$ MHz.
$D = 2{,}000$ miles,
then $L = 37 + 87 + 66$ dB.
$= 153$ dB.

Assuming a radiated power of 1 watt or +30 dbm., then the signal at the input to the receiver $= +30 - 153$, or —123 dbm.

This, of course, takes no account of antennae gains, feeder losses, etc., and assumes best case for antenna coupling between ground and satellite. However, it is clear that 1 watt will give something like 20 dB. of quieting in the satellite receiver. An increase of 20 dB., i.e. 10 watts into a 10 dB. gain antenna, would increase this input to almost 2 microvolts, which gives full quieting in the receivers and then some! In fact, mobile stations should be able to put an adequate signal up to the satellite. However, they may have some difficulty in hearing the downlink and this brings up the question of receiving equipment.

Before discussing the ground requirements for receiving the 75 cm. downlink transmissions, a few words on the satellite transmitters would be in order. The transmitters consist of a frequency modulated crystal oscillator at 13.5 MHz., multiplying up to 216 MHz. at a power level of 1.5 watts. This is passed to a varactor doubler, producing 1 watt output at 432 MHz. Assuming that a total of five channels are used, including the telemetry downlink, this requires a total output of 5 watts which, at an overall efficiency of 33% d.c. to r.f., means a d.c. input power of 15 watts is required for the transmitters only. As only 6 watts of charging power is available from the satellite's solar cells, this seriously limits the operating time of the system. However, as the transmitters draw no current in the absence of an input signal, the duty cycle will depend on the number of stations using the satellite during an orbit. As much of the time the satellite will be over areas of the world where there are no stations active, the situation is not quite so bad as first appears.

Assuming all the power generated is radiated, then one can calculate the received signal as for the uplink, plugging in the values for 432 MHz.

This gives:—

$L = 37 + 20 \log F + 20 \log D$
$= 37 + 66 + 52.7$
$= 155.7$
$=$ approximately 158 dB.

If 1 watt $= +30$ dbm.
then $Pr = +30 - 158 = -128$ dbm.

This corresponds to about 0.1 microvolt in 50 ohms at the terminals of a dipole, assuming the dipole to have unity gain. If a low noise (3-4 dB.) mast head amplifier is used, then an input of 0.1 microvolt will result. It is emphasised that these figures are a first approximation only and are best case. However, if an antenna gain of 10 dB. is available, this will boost the input to 0.7 microvolt, which should make a reasonable impression on a good quality f.m. receiver. It is unfortunate that high gain antennae yield narrow beamwidths, as this requires the antenna to track the satellite at all times. The higher the gain, the more accurate tracking must be.

Summarising these results, it is evident that the receiving requirements far outweigh the transmitting side.

However, on the credit side, being an f.m. system, the capture threshold is quite well defined, and once the signal exceeds this value, then the S/N ratio climbs rapidly.

Up to this point, nothing has been mentioned about Doppler shift on the signals. The uplink on 2 metres will have a maximum excursion of approximately 3.6 KHz. An a.f.c. loop in the receivers will automatically correct for this for each channel, providing the input signal is within 10 KHz. of the nominal centre frequency for the channel.

The downlink Doppler will be in the order of 11 KHz. maximum, and will require the receiving station to provide a.f.c. on his own receiver. Suitable circuits for this will be published in a later article.

This, then, summarises the f.m. system. With well-equipped stations, "press to talk" QSOs should be possible for most of the time that the satellite is "visible" between two ground stations. If all goes as planned, Amateurs throughout the world will have the unique opportunity to assess the suitability of all modes of communication by using both satellite transponders.

[An artist's impression of the type of satellite that OSCAR 6 will probably be is featured on the front cover of this issue.—Ed.]

1970 John Moyle Memorial National Field Day Results

Certificate winners are indicated in bold type.

SIX-HOUR DIVISION

Section A:

AX1AR/P2	432 points
VK2RJ/P	197 "
VK2ZCT/P	73 "
AX3ZA/P	**492** "
VK3AIH/P	398 "
AX3UJ/P	321 "
AX3ASV/P	136 "
VK3FW/P	94 "
AX3AHG/P	75 "
AX4GT/P	358 "
VK4PJ/P	313 "
AX4SF/P	188 "
AX5QX/P	217 "

Section B:

VK2YB/P	**114** points
VK2JM/P	100 "

Section C:

AX3HE/P	**272** points
AX3EZ/P	160 "

Section D:

AX3RZ/P	**637** points
AX3BBC/P	452 "
AX5LP/P	156 "

Section E:

AX1DH	**275** points
VK4UG	90 "
AX9KY	109 "

Section F:

L2230—S. Voron	**450** points
L2949—K. Nad	90 "
L4—S. Dellit	**410** "
L4018—C. Thorpe	130 "
L5015—W. Clayson	**150** "
L7043—R. Everett	**270** "
L7031—B. Mutton	255 "

24-HOUR DIVISION

Section A:

AX3ZAZ/P2	154 points
AX3DY/P	**1463** "
AX3BBR/P	714 "
VK3AOT/P	73 "
VK4ZDR/P	268 "
AX5ZE/P	568 "
VK5ZFE/P	118 "
VK5ZBT/P	128 "

Section B:

No entry.

Section C:

No entry.

Section D:

AX1ACA/P	2947 points
AX2AAH/P	**8091** "
VK3APC/P	6898 "
VK3ATO/P	4619 "
AX3ATL/P	3460 "
AX3AWI/P	2473 "
AX3XK/P	2233 "
AX3ER/P	721 "
AX4IO/P	1038 "
AX9XI/P	761 "

Section E:

AX3KS	175 points
AX3XB	175 "
AX8KA	**285** "

Section F:

L3383—C. McLachlan	**1625** points
L3308—A. Cox	740 "
L3312—M. Batt	535 "
L3—D. Harrison	270 "
L3042—E. Trebilcock	185 "
L4335—M. Joyce	**510** "
L4104—K. Cunningham	315 "
L5113—L. Earle (Mrs.)	**1518** "
L5096—T. Hannaford	1357 "

Check Logs:

AX3QV, AX9DR, and VK7RY

COMMENTS

The Field Day results this year showed a slight upward trend in the number of logs entered. However, the actual number of operators and assistants of multi-operator stations jumped to much higher figures than ever before. It would appear from checking the logs that the trend was towards greater group efforts from club stations.

From the logs, comments received indicated that the single operators would prefer the contest held on days that do not clash with the A.R.R.L. Contest, while the multi-operator stations are content to let the dates coincide.

VK5LP and VK5QZ are worthy F.D. operators. Conditions in the caravan at 1600 ft. in the Mt. Gawler area were such that temperatures reached 112° in the van at 10.30 a.m., and at noon the transistor heat sinks were too hot to touch, so rather than ruin the transistors, they closed down. However, they are undaunted, and will be out again next year. L2949 stated in his log that he had never heard a poorer contest, and what will the F.C.M. do for improvement?

Eric Trebilcock weighs in with the very pertinent comments "that it should be mandatory for S.w.l's to log the serial numbers received—it's a farce as it is now."

Our Region Three W.I.A. Director condescended (or just "conned") to write out the logs for VK3AWI/P this year, but had a problem with the 20 metre logs: "they" lost them!

For the operation of AX3APC/P, VK3AKJ writes "Two teams were entered by the Moorabbin Club for the 1970 N.F.D. One team operated under the call sign VK3XK/P and the other under the Club call sign of VK3APC/P In addition at least six other Club members were Portable for all or part of the week-end.

"The Club station was situated at Mount Blackwood, some 50 miles north west of Melbourne in the Pentland Hills. The site had all the advantage of being some 2,000 ft. above sea level with a first class v.h.f. aspect of Melbourne and Geelong, and an excellent take-off for the short path to the States on h.f. However, the site was a comparatively small one since the 'plateau' on the hill top was surrounded by sharp drops on all sides and the useable part was not more than 70 yards square. There was, not unexpectedly, some mutual interference between equipment

"The comparatively small operating crew, some of whom were new to field day activity, had been in training for some weeks beforehand, especially in regard to the setting up of masts and antennas. This prior activity paid off, and probably for the first time, nothing was forgotten, everyone got there on time, all gear and tents, etc., went up on schedule and without even the slightest problem.

"The self-congratulation on this side of things just had to be short lived! It was!

"Around 0300K on the Sunday morning a near gale blew up and continued for over four hours. The 80 metre antenna literally blew away, the 15 metre quad was completely wrecked and the 20 metre beam lost one half of its reflector. No tents actually blew down, but only because of some very prompt rigging action by those affected.

"After a couple of hours 'make-do-and-mend', the site was operational again with makeshift antennas on 80, 15 and 10 metres and the 20 metre monster operating as a two element device.

"As always, a close watch was kept on the progress of other friendly rivals in the field to see how numbers compared. The conclusion was drawn at the end of the day that the result was going to be very open since at least three teams (including VK3APC?) appeared to be fairly close together in total number of contacts

"The general concensus of opinion at the end of the Contest was that next year our engineering has to improve and some better technique be found to wring numbers out of overseas 'clients'.

"Perhaps the Contest Committee would consider the possibility of relaxing the requirement of a serial number from other than VK stations, especially if our Contest again coincides with the A.R.R.L. Contest."

AX1ACA/P writes that the VK2 Field Day and the National Field Day clash caused some confusion. Operation via repeaters was also mentioned and also that the Rules should state whether or not repeater operations should be allowed for contest working

AX4GT suggests improving the Contest by awarding a certificate for top scorers in each section of all call areas.

Harold Burtoff, on behalf of his group, writes how they did enjoy the Contest, and on the high percentage of young people in their group. He throws out a challenge to all and sundry, backing his group against all stations in next year's Contest. They had fourteen people involved, eight of whom were under 18 years of age.

Results this year have been published later than usual due to other magazine commitments. Also please note that the dates for next year's Contest are 13th and 14th February, 1971.

In conclusion, thanks to all who participated and submitted logs, and congratulations to the award winners.

—Neil Penfold
Federal Contest Manager, for Federal Contest Committee.

REMEMBRANCE DAY CONTEST, 1970

A perpetual trophy is awarded annually for competition between Divisions. It is inscribed with the names of those who made the supreme sacrifice, and so perpetuates their memory throughout Amateur Radio in Australia.

The name of the winning Division each year is also inscribed on the trophy and in addition, the winning Division will receive a suitably inscribed **Certificate**.

Objects

Amateurs in each Call Area, including Australian Mandated Territories and Australian Antarctica will endeavour to contact Amateurs in other Call Areas on all bands. Amateurs may endeavour to contact any other Amateurs on the authorised bands above 52 MHz. (i.e. intrastate contacts will be permitted in the v.h.f./u.h.f. bands for scoring purposes.

Contest Date

0800 hrs. GMT Saturday, 15th August, 1970, to 0759 hrs. GMT Sunday, 16th August, 1970.

All Amateur Stations are requested to observe 15 minutes' silence before the commencement of the contest on the Saturday afternoon. An appropriate broadcast will be relayed from all Divisional Stations during this period.

RULES

1. There shall be four sections to the Contest:—
   (a) Transmitting Phone.
   (b) Transmitting C.w.
   (c) Transmitting Open.
   (d) Receiving Open.

2. All Australian Amateurs may enter the Contest whether their stations are fixed, portable or mobile. Members and non-members will be eligible for awards.

3. All authorised Amateur bands may be used and **cross-mode operation is permitted.** Cross-band operation is not permitted.

4. Amateurs may operate on both Phone and C.w. during the Contest, i.e., Phone to Phone or C.w. to C.w. or Phone to C.w. However only one entry may be submitted for sections (a) to (c) in 1.

An open log will be one in which points are claimed for both phone and c.w. transmissions. Refer to Rule 11 concerning Log entries.

5. For Scoring, only one contact per station per band is allowed. However, a second scoring contact can be made on the same band using the alternate mode. Arranged schedules for contacts on the other bands are prohibited.

6. Multi-operator stations are not permitted. Although log keepers are permitted, only the licensed operator is allowed to make contact under his own call sign. Should two or more wish to operate any particular station, each

Remembrance Day Contest Trophy

will be considered a contestant and must submit a separate log under his own call sign. Such contestants shall be referred to as "substitute operators" for the purposes of these Rules and their operating procedure must be as follows:—

Phone: Substitute operators will call "CQ RD" or "CQ Remembrance Day" followed by call of the station they are operating, then the word "log" followed by their own call sign, e.g., "CQ Remembrance Day from VK4BBB log VK4BAA."

C.w.: Substitute operators will call "CQ RD de" followed by the group call sign comprising the call of the station they are operating, an oblique stroke and their own call, eg., "CQ RD de VK4BBB/VK4BAA."

Contestants receiving signals from a substitute operator will qualify for points by recording the call sign of the substitute operator only.

7. Entrants must operate within the terms of their licences.

8. Cyphers—Before points may be claimed for a contact, serial numbers must be exchanged and acknowledged. The serial number of five or six figures will be made up of the RS (telephony) or RST (c.w.) reports plus three figures, that will increase in value by one for each successive contact.

If any contestant reaches 999 he will start again with 001.

9. Entries must be set out as shown in the example, using ONLY ONE SIDE of the paper and wherever possible standard W.I.A. Log Sheets should be used. Entries must be clearly marked "Remembrance Day Contest 1970" and must be postmarked not later than **6th September, 1970.** Address them to "Federal Contest Manager, W.I.A., G.P.O. Box N1002, Perth, 6001, West. Aust." Late entries will be disqualified.

10. Scoring will be based on the table shown.

SCORING TABLE

From \ To	VK0	VK1	VK2	VK3	VK4	VK5	VK6	VK7	VK8	VK9
VK0	–	6	6	6	6	6	6	6	6	6
VK1	6	–	1	1	2	3	5	4	6	5
VK2	6	3	–	1	2	3	5	4	6	5
VK3	6	4	1	–	2	1	4	3	6	5
VK4	6	3	1	2	–	3	6	5	4	3
VK5	6	5	2	1	3	–	4	3	3	6
VK6	6	6	2	1	4	2	–	3	5	6
VK7	6	5	1	1	3	2	5	–	5	6
VK8	6	5	1	1	2	3	6	4	–	3
VK9	6	5	1	2	3	4	5	6	1	–

Note.—Read table from left to right for points for the various call areas.

In addition, all intrastate contacts on 52 MHz. and above are worth 1 point each per band.

Portable Operation: Log scores of operators working outside their own Call Area will be credited to that Call

EXAMPLE OF TRANSMITTING LOG

Date/ Time G.M.T.	Band	Emission and Power	Call Sign Worked	RST No. Sent	RST No. Received	Points Claim.

Note.—Standard W.I.A. Log Sheets may be used to follow above form.

EXAMPLE OF RECEIVING LOG (VICTORIAN S.W.L.)

Date/ Time G.M.T	Band	Emission	Call Sign Heard	RST No. Sent	RST No. Received	Station Called	Points Claim.
Aug. '70							
15 0810	7 Mc.	A3 (a)	VK5PS	58002	—	VK6RU	1
15 0812	"	"	VK6RU	58007	—	VK7EJ	4
15 1035	52 "	A3	VK4ZAZ	58010	—	VK5ZDR	2
15 1040	"	"	VK3ALZ	58025	—	VK3QV	1

Note.—Standard W.I.A. Log Sheets may be used to follow the above form

Area in which operation takes place, e.g. VK5ZP/2. His score counts towards N.S.W. total points score.

11. All logs shall be set as in the example shown and in addition will carry a **front sheet** showing the following information:—

Name . Section

Address Call Sign

. Claimed Score

No. of Contacts

Declaration: I hereby certify that I have operated in accordance with the Rules and spirit of the Contest.

Signed

Date

All contacts made during the Contest must be shown in the log submitted (see Rule 4). If an invalid contact is made it must be shown but no score claimed.

Entrants in the Open Sections must show c.w. and phone contacts in numerical sequence.

12. The Federal Contest Manager has the right to disqualify any entrant who, during the Contest, has not observed the regulations or who has consistently departed from the accepted code of operating ethics. The Federal Contest Manager also has the right to disallow any illegible, incomplete or incorrectly set-out logs.

13. The ruling of the Federal Contest Manager of the W.I.A. is final and no disputes will be discussed.

Awards

Certificates will be awarded to the top scoring stations in Sections (a) to (c) of Rule 1 above, in each Call Area, and will include top scorer in each Section of each Call Area operating exclusively on 52 MHz. and above. VK1, VK8, VK9 and VK0 will count as separate areas for awards. There will be no outright winner for Australia. Further Certificates may be awarded at the discretion of the Federal Contest Manager.

The Division to which the Trophy will be awarded shall be determined in the following way.

To the average of the top six logs shall be added a bonus arrived at by adding to this average the ratio of logs entered to the number of State Licensees (including Limited Licensees), multiplied by the total points from all entries in Sections (a), (b) and (c) of Rule 1.

$$\text{Average of top six logs} + \left\{ \frac{\text{Logs Entered}}{\begin{array}{c}\text{State Licensees}\\ \text{includ. Z Calls}\end{array}} \times \begin{array}{c}\text{Total Pts. from}\\ \text{all Entrants in}\\ \text{Sect. (a) (b) (c)}\end{array} \right\}$$

VK1 scores will be included with VK2, VK8 with VK5, and VK0 with VK7. Also, VK9 logs and score will be added to the Division which is geographically the closest.

Acceptable logs for all Sections shall show at least five valid contacts.

The trophy shall be forwarded to the winning Division in its container and will be held by that Division for the specified period.

RECEIVING SECTION
(Section D)

1. This section is open to all Short Wave Listeners in Australia, but no active transmitting station may enter.

2. Contest times and loggings of stations on each band are as for transmitting.

3. All logs shall be set out as shown in the example. The scoring table to be used is the same as that used for transmitting entrants and points must be claimed on the basis of the State in which the receiving station is located. A sample is given to clarify the position.

It is not sufficient to log a station calling CQ—the number he passes in a contact must be logged.

It is not permissible to log a station in the same call area as the receiving station on the m.f. and h.f. bands 1.8-30 MHz., but on bands 52 MHz. and above such stations may be logged, once only per band, for one point. See example given.

4. A station heard may be logged once on phone and once on c.w. for each band.

5. Club receiving stations may enter for the Receiving Section of the Contest, but will not be eligible for the single operator award. However, if sufficient entries are received a special award may be given to the top receiving station in Australia. All operators must sign the Declaration.

Awards

Certificates will be awarded to the highest scorers in each call area. Further Certificates may be awarded at the discretion of the Federal Contest Manager.

THE W.I.A. TIE

At the Federal Conference in Adelaide last Easter it was decided to obtain a tie which could be worn by members of the Institute. A design was proposed at the meeting and after consultation with the tie makers it is now ready for production. The illustration shows the general conception. Two ties will be available, one in navy blue and

the other in deep red or maroon, and the material will be washable terrylene. Each will have a single small W.I.A. badge with the map in white and the detail in red.

Colour photographs and colour slides showing the samples in full colour are being circulated to all centres and orders are awaited. We feel sure that the tie will be well received because it is a very handsome tie and will do justice to almost any suit.

Sales will be on the basis of cash with order, and ties will only be ordered after the money has been received at W.I.A. headquarters. The price to members will be about $2.50 and the delivery time will be about five months. Division Secretaries are requested to get their orders in quickly so that the first batch can be ordered without delay.

FEDERAL PRESIDENT OVERSEAS

The Federal President of the W.I.A., Mr. Michael Owen, VK3KI, left on 19th June for a world tour which is expected to last six weeks. Whilst overseas he will be visiting Amateur Societies for discussion with their officials and arrangements have been made for him to meet officers in Philippines, Hong Kong, Japan, India and Thailand.

His tour will include U.S.A., England and Europe. It is hoped that talks with A.R.R.L. and I.A.R.U. officials in these countries will provide information on I.T.U./I.A.R.U. affairs that will assist the Institute and Region 3 organisation in their Space Conference proposals.

Although part of Michael's trip will be concerned with business, the primary aim in many ways is essentially Amateur/I.T.U. orientated. Federal Council have agreed that part of the expense should be borne from I.T.U. funds and the Region 3 organisation has also made a contribution of $300 with additional assistance from "A.R."

Federal Council and Executive are looking forward to frequent taped reports on his encounters, which will be published in "A.R."

BECKET FESTIVAL STATION, GB2CF

7, Old Fold,
Chestfield,
Whitstable, Kent,
England.

Secretary, W.I.A.,

Dear Sir,

We should be very grateful if it could be brought to the attention of Radio Amateurs in Australia of the Becket Festival Station, GB2CF, active from Canterbury, England, from 19th to 26th July inclusive.

This station will form part of the Becket Festival and QSOs, which will be QSL'ed with a suitable card, will be most welcome.

QSOs with stations in towns in Australia called Canterbury or any of the following local towns and villages which surround our city would be most welcome.

Ash, Aylsham, Bekesbourne, Bridge, Chilham, Chartham, Faversham, Eltham, Herne Bay, Herne, Ickham, Kingston, Littlebourne, Patrixbourne, Sturry, Selling, Stelling, Wye, Wingham, and Wickhambreux.

Yours sincerely,
D. L. Smith, G8CUC
(Acting in co-operation with G3LCK, G3XDV, G3XWQ)

NEW CALL SIGNS

FEBRUARY 1970

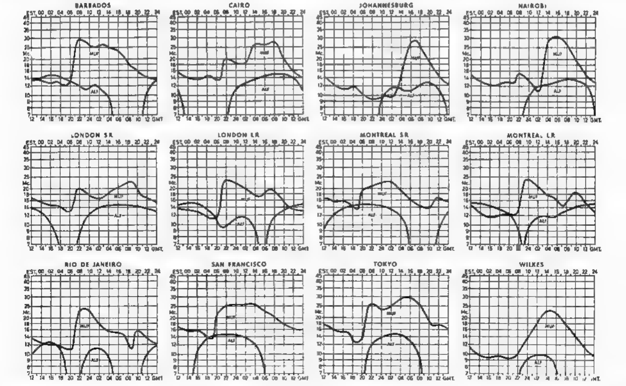
VK1EB—E. F. Bacon, 7 Bonney St., Ainsley, 2602.
VK1ZVG—G. A. Cohen, 39 Quandong St., O'Connor, 2601.
VK2EM—School of Applied Elect., Sydney Technical College, Harris St., Ultimo, 2007.
VK2GR—A. B Mason, 16 Queens Rd., Asquith, 2078.
VK2IO—R. E. Durrant, 12 Harper St., North Epping, 2121.
VK2OA—W. J Lark, 9 Cosimo St., Toongabbie, 2146.
VK2AJZ—C. E. Haycock, 17 Ivanhoe St., Marrickville, 2204.
VK2ATW—T E Whitfield, 1/41 Ross St., Oatley, 2223.
VK2BJS—J. B. Stacy, Station: Panorama Rd., Calala, 2340; Postal R.M.B. 832C, Panorama Rd., Calala, 2340.
VK2BLA—W L. Laird, 93 Kentucky St., Armidale, 2350.
VK2BSL—K. M. Cunningham, 55 Marshall St., New Lambton Heights, 2305.
VK2BWL—W. Robertson, 80 Albany St., Coffs Harbour, 2450.
VK2ZIT—S. R. Gregory, 5/137 Cowper St., Goulburn, 2580.
VK2ZPZ—W. Frost, 98 Young St., Cremorne, 2090.
VK2ZYR—D. L. Dwyer, 3/26 Brittain Cres., Hillsdale, 2036.
VK3ADX—F W. Heeps, 392 Bridge Rd., Richmond, 3121.
VK3AUE—R. C. Greig, Station: "Reta Park," Ringwood Rd., South Warrandyte; Postal 80 Montego Key, Novato, California, U.S.A., 94947.
VK3BBS—W. T. R. Ward, 220 Cardigan St., Carlton, 3053.
VK3BBT—D. G Taylor, 3 Elsa Crt., Eltham, 3095.
VK3BBU—P. B. Parry, 12 Milverton St., Moonee Ponds, 3039.
VK3BBV—J. T. Cunningham, 11 Catherine Pde., Frankston, 3199.
VK3BCF—C F. Bicknell, 13 Roland Ave., Strathmore 3041.
VK3BCO—G. J Cohen, 10 Lemon Gr., Nunawading, 3131.
VK3BDA—D. V Hambleton, 28 Jacqueline Rd., Mt. Waverley, 3149.
VK3BKK—K. H. King, 15 Stonehaven Cres., Moorabbin, 3189.
VK3YAC—S. J. Whitehead, 285 Gallaghers Rd., Glen Waverley, 3150.
VK3YBT—H. Y. O'Hanlon, 10 Lyons St., Glenhuntly, 3163.
VK3ZFZ—C. L. Lane, Fussell St. South, Ballarat, 3350.
VK3ZZE—W. D. Powis, 17 Barlyn Rd., Mt. Waverley, 3149.
VK4YS—R. A. Sedunary, Riverside Caravan Park, North Rockhampton, 4701.
VK4ZKV—R. H. Kyle, 17 Allden Ave., Southport, 4215.
VK5LV—J. R. Godson, 4 Fairlie St., Ottoway 5013.
VK5SY—D. M Smothers, Travelodge, Motel, South Tce., Adelaide, 5000.
VK5ZLL—L. G. Douglas, 123 Flinders Tce., Port Augusta, 5700.
VK5ZZA—B. J Lenny, 14 Garlick Rd., Elizabeth Park, 5113.
VK6BK—G P Anderson, 16 Stone St., Maylands, 6051.
VK6DE—A W Storm, 389 The Boulevard, City Beach, 6015.
VK6KR—K E. Reeves, 14 Pontiac Ave., Cloverdale, 6105.
VK6LK—G. R. K. Lyon, 450 Riverton Dr., Riverton, 6155.
VK6WB—A. F Jacobsen, Apt. 3, Lot 5, Scott St., South Perth, 6151.
VK6CID—L. W Hoobin, Station: Portable; Postal 772 Glenhuntly Rd., South Caulfield, Vic., 3162.
VK6ZAG—G. E. Watts, Station O.T.C. (A), Res. 3, Browns Range, Carnarvon, 6701; Postal P.O. Box 96, Carnarvon, 6701.
VK7HP—H. Poxon, 9 Elms Rd., Sandy Bay, 7005.
VK8ZCE—R J Sieber, 28 Lindsay Ave., Alice Springs, 5750.
VK9AC—T Ivins, Station: Lot 1, Section 186, Jibaru Dr., Boroko, P., Postal C/o. Posts and Telegraphs Training College, Racecourse Rd., Boroko, P.
VK9DZ—M. J Groth, Station Martyr's Memorial School, Popondetta, P.; Postal, P.O. Box 35, Popondetta, P.
VK9GA—N. Spalding, Station Section 9, Allotment 1, Kavieng, N.G., Postal C/o. Posts and Telegraphs, Kavieng, N.G.
VK9HS—Station Tutt Bryants Auto Port, Malaguna Rd., Rabaul, N.G., Postal C/o. Airfast Charter, P.O. Box 401, Rabaul, N.G.
VK9NS—R. S. Sleeth, Station Norfolk Island, 2899; Postal Box 223, Norfolk Island, 2899.
VK9VT—V T Freeh Rev., Catholic Mission, Lemakot, Kavieng, N.G.
VK9WF—W Frost, Station Port Moresby, P. Postal P.O. Box 3155, Port Moresby, P.

CANCELLATIONS

VK1TO—R K Westbrook Now VK1KO.
VK1ZOO—J A Gardner Transferred to Qld.
VK2AM L. D. Cuffe Not renewed
VK2GE—M E. Datson Transferred to W.A.
VK2OA—School of Applied Electricity Now VK2EM
VK2SO W F Nobles. Not renewed.
VK2ALK W J Lark Now VK2OA.
VK2ZEG—W L. Laird. Now VK2BLA.
VK2ZFQ—J E Andersen Transferred to Tas.
VK2ZHW G E. Watts Now VK6ZAG.
VK2ZKC—K M Cunningham Now VK2BSL.
VK2ZPO—C. L. Scally Transferred to T.P.N.G.
VK3FF D. B. Sprow Not renewed.
VK3AJV—R. E. Durrant Now VK2IO.
VK3ACB—E. F O'Brien Deceased.
VK3AUU—D. D. Tanner Transferred to S.A.
VK3YAK—S. J Whitehead. Now VK3YAC.
VK3ZKH—G J Cohen Now VK3BCO.
VK3ZMS—J M Bywaters. Not renewed.
VK3ZPC—P M Cohn Transferred to N.S.W
VK3ZUO—W G. Raynor Transferred to N.S.W
VK4VJ—V Jeffs. Deceased
VK4ZDB—S R. Brooks Not renewed.
VK5ZCE—R J Sieber Now VK8ZCE
VK6AZ—B. A. Cook Transferred to Vic
VK6CH—J C. Hulse Transferred to S.A.
VK6DT—R. D. Trickett. Transferred to Vic.
VK6VH—L. W Hoobin Now VK6CID
VK6ZAJ—G Drage. Not renewed.
VK6ZBG—C. H Baker Deceased.
VK6ZDL—R G. Lukin. Not renewed.
VK6ZLM—L. K McPherson. Transferred to N.S.W
VK8RO—R S. Gurr Not renewed.
VK9ZAW—A J Watson. Not renewed
VK9ZGA—N Spalding. Now VK9GA.

PREDICTION CHARTS FOR JULY 1970

(Prediction Charts by courtesy of Ionospheric Prediction Service)



OVERSEAS AWARDS

ORIENT AWARD

From 1st January, 1970, the Orient Award became available to Amateurs throughout the world. The award will be made to licensed Amateurs who obtain the required number of points by making two-way contact with stations as specified in the Orient Award Countries List. The rules for the award are as follows.

1. The award is issued in three Classes, Class I., Class II. and Class III. Each class will be issued to the applicant according to the number of points contained in his application. These points will be calculated according to the table in paragraph 4. The minimum points required for qualification are.

Class I. Orient Stations, 150 pts., others, 120 pts.
Class II. Orient Stations, 100 pts., others, 80 pts.
Class III. Orient Stations, 75 pts., others, 60 pts.

"Orient Stations" are those located in countries which appear in the Orient Award Countries List (see further).

2. Endorsements for the award are issued in three categories:

(a) Two-way c.w.
(b) Two-way phone.
(c) Mixed.

3. Applications for the award must contain proof of two-way contact. In the case of Class II or III. applications, the proof may consist of a check list signed by two officers of the applicant's local or national society. Applications for Class I must consist of QSL cards and must be accompanied by sufficient postage for their return. Official application forms are available upon request.

4. Points are to be calculated as follows:
For contacts on 28, 21 and 14 MHz., 1 point per contact;
For contacts on 7 MHz., 2 points per contact.
For contacts on 3.5 MHz., 3 points per contact.
An applicant who contacts a station on five bands will receive a bonus of 5 points, in addition to the points earned for the individual contacts.

5. Applicants may claim only one station in each country on each band for points towards the award.

6. Only contacts with fixed or mobile land stations will count towards the award.

7. Only contacts made after 1st January, 1970, will count towards the award.

8. Only contacts with stations acceptable by the A.R.R.L. for D.X.C.C. confirmation will be acceptable for the Orient Award.

9. Applicants must include 10 IRCs or US $1 when applying for Class II. or Class III. award, or 50 IRCs or US $5 when applying for Class I. award and these should be sent to Awards Manager, P.O. Box 16321, Hong Kong.
Recipients of Class II. and Class III. awards will receive an attractive certificate suitable for framing. The Class I. award will be a teakwood and bronze plaque, hand engraved.

Special Note: The first station to receive the Class I. Orient Award will receive a special plaque, lacquered, with pearl inlay, handcrafted by Hong Kong's leading jewellery makers.

Orient Award Countries List:

AC3—Sikkim	UJ8—Tadzhik
AC4—Tibet	UL7—Kazakh
AC5—Bhutan	UM8—Kirghiz
AP—East Pakistan	VS6—Hong Kong
AP—West Pakistan	VU2—India
BV—Taiwan	VU4—Laccadive Is.
BY—China	VU5—Andaman Is.
CR9—Macao	XU—Cambodia
HS—Thailand	XV5—Vietnam
HL, HM—Korea	XW8—Laos
JA, JH, KA—Japan	XZ2—Burma
JT—Mongolia	YA—Afghanistan
KR6, KR8—Ryukyu Is.	4S7—Ceylon
UA9, UW9—Asiatic U.S.S.R.	9M2—West Malaysia
	9N1—Nepal
UA0—Asiatic U.S.S.R.	9V1—Singapore

COBRA AWARD

City of Baltimore Radio Award by City of Baltimore Radio Association. Work 25 stations in metropolitan area with at least 10 of them members of the COBRA.

DX stations outside North America and south of Panama need work only 15/7, contacts after May 1961. GCR list, log data, and 50c (U.S. or equiv.) AOMB/M to W3LE, Louis Bremer, 7704 Old Hartford Rd., Baltimore County, Maryland, 21234, U.S.A.

Ask W3 stations if they are a member of COBRA.

WINNIPEG DX CLUB AWARD

In honour of the Centennial of the Province of Manitoba, the Winnipeg DX Club is pleased to announce a new award of lasting value to Amateurs throughout the world.

The award consists of a personalised presentation case containing a genuine new Canadian Silver Dollar issued by the Royal Canadian Mint in honour of Manitoba's Centennial. The award will be mailed to all successful applicants.

All contacts must be made after January 1, 1970, and the following rules apply:

1. A total of 31 contacts are required, representing five from each of the continents of Africa, Asia, Europe, North America, South America, Oceania and one contact from any Antarctic station. The I.A.R.U. continental boundaries apply.

2. The contacts from each continent may be from different countries on that continent, but the five North American contacts must be with members of the Winnipeg DX Club.

3. Contacts can be made on any band or mode, but a station can only be counted once.

4. QSL cards must be in the applicant's possession, but need not be submitted if a verified list of same is sent.

5. Amateurs throughout the world are eligible. Canadian, American and Mexican applicants must be a member of DXCC and must submit the number and date of their DXCC certificate. Amateurs in other parts of the world do not have to be members of DXCC.

6. The cost of the award is 15 IRCs. If IRCs are not available in a particular country, the applicant may send mint stamps of that country to an equivalent value.

7. Members of the Winnipeg DX Club are VE4s: AA, AE, AS, BJ, CJ, DM, MP, TJ, RP, SA, SD, SK, XJ, ZX.

8. Award Custodian is VE4AE, 32 Sweetwood Bay, Winnipeg 17, Manitoba, Canada.

MANITOBA CENTENNIAL (1870-1970) AWARD

The Amateur Radio League of Manitoba will present certificate awards to Amateurs submitting proof of the requisite contacts with Amateur Radio stations in Manitoba.

Rules. All contacts must be made after 31st December, 1969. Contestants must accumulate 100 points. W/K, XE and VE stations receive two points per contact. All other stations receive five points per contact.

A contact consists of exchanging signal reports. Contacts may be made on each band and may be made on different modes on each band. Cross-mode contacts are not allowed.

Two different members of the Amateur Radio League of Manitoba will be designated "Bonus Hams" each month. Contacts with these stations will be worth double points.

QSL cards are not required. Contestants should send a copy of their log and two IRCs to Mr. J. N. Knowles, VE4JK, P.O. Box 365, Carman, Manitoba, Canada.

GCR (General Certificate Rule)

When an award states "GCR" the following applies to that award. Any officer of a recognised A.R.C./Society, any official or gv't with Notary Public authority, any two licensed Amateurs at higher level licences or any CHCer may GCR that he has sighted listed QSLs in applicant's possession. Sponsor still reserves right to request one, a few or all be sent as proof if doubt exists.

☆

FEEDBACK

We are advised by the author of "Count and Display at $6 per Decade," "A.R.," June 1970, of two corrections to be made to his article:

1. In the circuit diagram the capacitor conveying the reset pulse to the first stage of the quinary section should be 1,000 pF. and NOT 220 pF.

2. In the references, the article by Goodes is in issue 9 of Practical Electronics and not No. 3.

W.I.A. COMMENTS ON SPACE FREQUENCY CONFERENCE

(Continued from Page 4)

The W.I.A. Project Australis Group is planning a further satellite in co-operation with the A.M.S.A.T. Group and redundant command systems are planned to control the transmitter power, to select transmitter frequencies and to switch the transmitter off when not in use. A copy of the "General Specification"* is annexed and is illustrative of the advanced nature of current Amateur space experiments. It should be pointed out that most satellites are designed for low orbit and therefore their coverage is limited. Again, reference is made to the little likelihood of interference being in fact caused, referred to above.

Accordingly, the W.I.A. recommends the following as a footnote or recommendation for the Radio Regulations.

"Satellites in the Amateur Service may transmit in a shared band if a reliable means is provided to control emissions so as to prevent interference to stations of a primary service in the band."

If adopted as a footnote to one or more shared bands, the provision would read as follows.

"Satellites in the Amateur Service may transmit in this band if a reliable means is provided to control emissions so as to prevent interference to stations of a primary service in this band."

7. **THE BAND 21-22 GHz.**

It has been suggested that the band 21-22 GHz. be abandoned in favour of an allocation of 24-24.5 GHz. where the Amateur Service would be a secondary allocation. In support of this proposal it has been suggested that components are at present easy to obtain on the alternative allocation.

It is the view of the W.I.A. that the serious experimenter can overcome this difficulty and it is further the view of the W.I.A. that the existing exclusive allocation should be preserved for the Amateur Service in preference to the allocation of a shared band, bringing with it at least the possibility of harmful interference.

In addition, it is noted that at present this is the upper limit of band allocations to the Amateur Service, at least as far as Australia is concerned. In the U.S.A. no limitation is imposed on the Amateur Service above 40 GHz.

The W.I.A. suggests that a similar position should apply in Australia, or alternatively, on a world-wide basis, allocations should be made to the Amateur Service at frequencies above 22 GHz.

CONCLUSIONS

The W.I.A. contends that it is in the national interest that the Amateur Service should be encouraged as much as possible in the matters under discussion and that this is best achieved by imposing a minimum of regulations and restrictions upon the operation of Amateur Radio satellites.

The W.I.A. suggests that space usage by the Amateur Service should be permitted on any frequency exclusively allocated to the Amateur Service, and that on shared bands, Amateur space usage should be permitted, provided that adequate telecommand facilities are available to avoid interference with services having higher priorities, should it occur.

In addition the W.I.A. recommends the retention for the Service of the existing 21-22 GHz. exclusive allocation, and that the right be granted to the Amateur Service to use frequencies higher than 22 GHz.

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AUSTRALIAN 432 AND 1296 MHz. RECORDS

As announced in last month's "Amateur Radio," the then current records for 432 and 1296 MHz. were subject to superior claims.

The results of these claims are now available and the new Australian records are as follows:

432 MHz.
AX7ZRO/7 to AX3ZKR, 15/3/70, 482 miles.
1296 MHz.
AX4NO/4 to AX4ZT/4, 12/4/70, 250 miles.

—D. H. Rankin, Federal Executive.

* The "General Specification" is too large and complex a document to reproduce in "A.R."—Ed.

VHF

Sub-Editor: ERIC JAMIESON, VK5LP
Forreston, South Australia, 5233.
Closing date for copy 30th of month.

AMATEUR BAND BEACONS

VK4	144.380	VK4VV, 107m. W. of Brisbane.
VK5	53.000	VK5VF, Mount Lofty
	144 800	VK5VF, Mount Lofty
VK6	52.006	VK6VF Tuart Hill.
	52 900	VK6TS, Carnarvon
	144.500	VK6VE, Mt Barker
	145.000	VK6VF, Tuart Hill
	435.000	VK6VF, (on by arrangement)
VK7	144.900	VK7VF, Devonport
ZL3	145.000	ZL3VHF, Christchurch.
JA	51.995	JA1IGY, Japan.
W	50.091	WB6KAP U S A.

A couple of items on the subject of beacons are noted in the May issue of the Western Australian V.h.f. Group News Bulletin, firstly that at the Group's April meeting it was decided to sell the Mount Barker Beacon to the Southern Electronics Group—in the absence of other information we could surely assume this is a group of interested Amateurs in the Albany or near areas, and who will keep the beacon running. The second item is that the Perth (Tuart Hill) beacons were off the air from 20th April, with a proposal to re-instate them at the QTH of Tony VK6ZK. I hope the VK6s will keep me informed of any moves of the beacons so the list may be kept current. They have been listed complete this month.

Six metres continues to provide a lot of interest in the northern areas of this continent, and whilst some of the following news is a bit old, it is still interesting to read. I am indebted to Doug VK8KK in Darwin for the following: During April VK6VV/4 worked DU1MM in the Philippines on 52.120 MHz. Good work, Brian. Doug said he missed this one as he was inside watching the wrestling on Indonesian TV!!! On 22nd March, JA2AYM worked VS6BF (Hong Kong) on about 50.100, so that's an area we haven't thought much about before. Stan W6ABN reported in April the first trans-equatorial 50 MHz. DX to South America for the season. Apparently there are many keen 6 metre operators up and down the West Coast of U.S.A. really keen to get into South America. ZK1AA is a regular to KH6, and the same station was very happy to work K6AGI recently! I would be too! Doug reports a number of stations being heard on back-scatter, Tony VK5ZDY being one, quite a considerable distance for such propagation. Thanks Doug for your interest, and I pass on your hint: "Watch 6 metres each evening from run-down to 1300z, 52 MHz. and above for the JAs".

While still on 6 metre DX, Bob VK2ASZ provides an interesting run down of VK2 activity during the equinoctial period. He reports that John VK9JL operates 53032 AM, from Madang. VK9GA is another on 6 metres, while ex-VK2ZEN and VK2ZPO 52525 make the VK9 scene a more favoured area for the coming DX season. Going back to the JA opening, on 25th April, reported in June issue, Bob says the first indications of something to come was the Russian t.v. which appeared on 49.750 MHz. about 1200 EST, followed by ZL1 t.v. He then worked Bart VK3VL and noticed beam direction had no effect. At 1330 JA1IGY beacon appeared, then VK4s at S9 plus with JAs in background. Between 1400 and 1815 Bob worked 58 JAs from all districts, and heard JAs working VK1, 2, 3, 4 and 7. ZL t.v., Russian t.v and JA1IGY remained a constant S8 throughout. About 1815 skip appeared to shift to VK5 and he could hear the JAs concentrating on that State. Bob reported the skip appeared to move from JA1 in Eastern Japan slowly to JA6 in the West with each area booming in in turn, and remarked it was most unusual to hear Es and F2 at the same time. On checking his log, Bob could see a build up in the pattern of things, ZL t.v on 51.750 was heard on 10 different occasions at good strength during March and April, while during the same period Russian t.v. on 49.750 was heard 12 times, and on no less than 4 occasions worked JAs, including 20 of them in an opening on 13th April. Thank you Bob, that has brought everyone up to date on your area.

Two metres seems to have been relatively quiet if the absence of news from most areas is any guide. Did note that Tony VK5ZDY had a 5 x 9 contact with Wilf VK7WF at 2300 EST on 23rd May, a good effort. Seemed to be too cold for everyone else to be in their shacks though.

Did hear a whisper on the air that some long distance workings had taken place in VK4 during May on 432 and/or 1296 MHz. My efforts to get anything further on this have met with no response.

MEET THE OTHER MAN

Bob Lear, VK2ASZ, of 179 Rusden Road, Blaxland, first commenced Amateur operations in 1955, and has since left his mark on v.h.f. activity. He works as a v.h.f. 2-way radio service technician, but has branched out into other fields as well. He has held a Private Pilot's Licence for 15 years, and occasionally goes 148 MHz. aeronautical! Last year he completed 4 years' training for Flight Navigator (seems to be a terror for punishment!) Married, with two children, Bob has certainly put a lot of effort into his Amateur operating, both v.h.f. and h.f.

He runs 100 watts on 6 metres using parallel 6146s to a 6/6 antenna 55 ft. high. 829B modulator, 6ES8 cascode converter. His 144 MHz. gear also runs 100 watts of a.m. to a QQE06/40, 10 over 10 slot antenna 50 ft. high, E88CC cascode converter, modulator push-pull 6DQ6s. The tunable i.f. for these two bands is an SX100 Hallicrafters. 30 watts of a.m. provides a nice signal on 432, using a QQE03/20 to an 11 element yagi, 50 ft high. Converter uses EC88 (two stages of grounded grid to a 1N21 crystal mixer, fed into the 6 metre converter. Also operates 80 through 10 metres with a Drake TR3 s.s.b. machine.

Areas worked on 6 metres include VK1 to 9 inclusive ZL1 to 4 inc., JA1 to 9, JA0, Willis Is. (VK9) and Papua (VK9). On 144 MHz. VK1 and 2, ZL1, 2 and 3, and VK1 and 2 on 432 MHz. He has also operated on 10,000 MHz. for a short while. He originally held the 144 MHz Australian record for three years from 31/12/61 for his contact with ZL3AQ, he has certificates for 50 MHz. W.A.S., V.H.F.C.C. 50, V.H.F.C.C. 144, A.J.D., several Ross Hull Contest Certificates, and recently claimed D.X.C.C and W.A.C. for h.f contacts.

He is a member of the W.I.A. and during 1958 and 59 was Secretary and V.h.f Scribe for the VK2 V.h.f. Group. His plans for the future include building equipment for 1296 MHz., more on 10,000 MHz., continuing with television experiments, and will soon be transmitting pictures on 432. He will be trying very hard to work ZL4 on 144 MHz. in 1974-75, and also New Zealand on 432 at the same period. His location is Blaxland, 45 miles west of Sydney, in the lower Blue Mountains, 850 feet above sea level.

Bob also mentions that he has arranged facilities so he can take out his whole station portable, and has often done so for v.h.f. field days and national field day. During the past several years he has tried various mountain tops over much of N.S.W., from Mt. Ebor 300 miles to the north, to Snowy Mountains in the south. These latter he has given away as they are too cold. He still runs 100 watts portable to big beams, but the overall results for long distance working have been disappointing. (This invariably seems to be the case with all of us on mountain tops.—5LP.) Bob does operate on net frequencies, but would like to see many operators on such frequencies try the DX to be had on other portions of the bands. He throws in a final comment, that although he does a lot of work with solid state equipment, he is far from convinced that valves have been replaced by transistors for serious v.h.f. work!!

STOP PRESS

What is probably the first ever 6 metre contact between VK and VS was made on 2nd June by VK8KK and VS6DA. More details will be included in the v.h.f. notes next month.

VK5s are reminded of their Intra-state Contest scheduled for Sunday, 26th July. The VK5 Contest Committee has studied last year's results closely, and amended the rules where desirable. Full details have been published in the "South Australian Journal", but briefly you are reminded that one of the aims of the contest is to bring the v.h.f. and h.f. operator closer together by giving incentives for cross band working between the two sets of bands.

None of my usual scribes have written this month so news is a bit scarce. However, the Editor will appreciate this after the big two-page spread last month! We will close with the thought for the month: "Men may be convinced, but they cannot be pleased, against their will." Until next month, 73, Eric VK5LP The Voice in the Hills.

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750

(At times in GMT)

Again we have a gradual decline in conditions, although there have been some fantastic openings on 28 metres. Although the higher frequencies have slackened off, there is a gradual upswing on 40, if you can battle the interference, also on 80. Sunspot forecast for June and July is 84 and 82, and at the time of writing the latest confirmation was 118 for January.

There have been some good operations over the May period, most important could well be the San Marino efforts from DJ9MJ, DK3LR and DL3RL. QSLs for these stations go to their home addresses. Other good ones were the FO8T/FC operation by G3BID, QSLs to W3CTN, also Zanzibar activity by 5H3LV/A, whose manager is VE3ODX, Box 717, Postal Station "Q", Toronto 7, Ontario.

GB2CF is the call of the station used for the Becket Festival at Canterbury during the period 19th to 26th July inclusive. I understand a special QSL is available. (Details elsewhere this issue.—Ed.)

Similarly GB3FON will be the call of the station covering the Festival of Nottingham which runs from 11th to 26th July. Frequencies for the latter are 1920, 3760, 7080, 14280, 21280 and 28680. An attractive Robin Hood Emblem QSL is to be sent to all stations confirming contact with the Festival station.

I have mentioned the activity of King Hussein JY1 quite regularly over the past three months, however it will be admitted that this operation is worthy of more than a passing glance. Hussein dislikes the dog-piles which have plagued his activities and I reported last month that well known scribe Wayne W8NSD/1 had been operating the station for a week in order to clear the air a little. It has since been reported that WA3HUP and OM W3GE have made a three-week visit checking into the YL-SSB net when possible. A W8 was due to go and assist from 18th May.

Recently reported from Kure Is. by KM6DG/KH6 should have included full QSL information which is Box 100, F.P.O., San Francisco, California, 96614. Evidently the wrong zip-code was issued in a previous bulletin.

Once again Thor Heyerdahl has set out on a cross Atlantic voyage, this time in "RA 11". He is equipped with radio gear, and when power is available he will be on using the call LI3B. He has been heard in the U.K. working W4ETO and LI3A, the latter being the official call of LA5KG for traffic purposes. The frequency in use was 14214 s.s.b., and the time of operation 1910z.

TC0 is a special prefix being used by stations in Istanbul over the last week-end in May to commemorate the conquest of that city. All QSOs will be confirmed by a special QSL, and there is an award available for working five Istanbul stations between 1800z on 29th May, and 1800z, 31st May. All bands and modes, and a station can be counted again if worked on another band. Logs to T.R.A.C., Box 699, Karakoy, Istanbul, Turkey, by 15th July. The stations eligible are TC9AE, AV, DS, EA, HY, IB, KT, MT, NC, NF, OR, QR, VG and WR.

W4BPD should be active now. He was expected to leave New York on 19th May, arriving in Kenya the next day. His F0VP licence has apparently been endorsed for operation on most if not all French possessions, so he could turn up anywhere at any time. His frequencies are 3500/05, 7000/05 and so on in the c.w. segments of all bands, and on s.s.b. he is expected to use 3790 to 3800, 7080/7070, 14180/185, 21245/21250, 28490/500. All QSLs now go to W3MZV.

John VS5JK was due back home to G-land on 25th May, and asks that all requests for QSLs from his VS5 operation go to home QTH G3KPV.

Operation by several IT1 stations from June 25-28 will be from Favignana Is. using the special prefixes IF and IU, and will be of assistance to prefix hunters only.

Unusual prefixes seem to be the fashion of late, some are exotic DX, others are valid as prefixes only, whilst many are purely and simply pirates. An interesting one came to light early in May calling himself Alpha Uniform 9 Victor Love, and was worked by Alex VK2ZA, and noted by Morrie VK2VN. The call sign was correct beyond any doubt, the date was 10th May on 20 metres, but the question is who was he? I admit this month I am a little out of touch with the bands, and I have not got the latest DX news out from overseas as yet, these may have the answer. If not, could anybody throw any light on this one. QRM prevented copy of any details from the transmitting station.

There is still plenty of activity from East Pakistan. Mohd AP5CP has a regular sked with K7ABV on 14020 c.w. at 1430, and is often on around 1430. It is understood that AP5HQ will assist in the arranging of skeds for the former. He can be found regularly on 14030 at about 0100z.

Further on the activity of ST2SA, who, being in a difficult zone, is eagerly sought after. His normal frequencies are about 14020, 21020 and 28040, with operating periods between 1400 and 1600, with a further look around between 0300 and 0400. QSLs may be sent via WA5REU.

John ZB2BO will be active from Gibraltar until the end of September, QRV all bands including 160 metres. He is often heard on 15 metres around 1400, but will arrange skeds if required. A line to him, J. Patrick, Flat 8, Sandpits, Gibraltar, should do the trick. John also operates the club station ZB2A. Another station, ZB2BY, is also active, QSL to GW3DIX.

EI1 is the special prefix allocated to Exhibition Stations in that country, and two recently active were EI1DMF from the Dundalk Festival until 24th May, and EI0AO, although not an exhibition station, was active over the last week-end in May from Bere Is. by the Limerick Radio Club. EI5BX will handle QSL chores for this operation.

From Fred VK2PF comes news that Bob VE3EWY was planning a DX-pedition to Dominica, St. Lucia and St. Vincent, spending four or five days at each location. The entire operation was due to take in most of June, and will be over by the time you read this. Calls were expected to be VP2DWY, VP2LWY and VP2SWY, and QSLs go to Bob's home address.

QSLs for the CR3SP operation between Sept. 1967 and Jan. 1969 have been unavailable to date, however they are now in the hands of manager W2GHK who will process them.

17th May was world communications day, this was observed by GB2ITU and GB3ITU, also DL0ITU with 4U7ITU. For their contacts on that day a special QSL was to have been issued. Also as a further commemoration, GB3FI from Flatholm Is. and GW3VKL/P from Lavernock Point operated specially to remember Marconi's transmission.

When the first effort of Marconi is mentioned, I never fail to think of a conversation I once had with one of our old timers, an Amateur of long standing back in the States. On asking me my call sign, I replied in my most apologetic voice that I was "only an S.w.l." His reply was that Marconi couldn't have conducted his experiments without a listener at the other end, and despite the opinions of some, a genuine S.w.l. has his place in the Amateur field.

PY7AWD/0 from Fernando de Noranha is still active, with operator Ara QRV daily at 0030-0100 working to a list compiled by PY4AP and WB6BWV. His normal frequency is as near as possible to 14280, but there have been reports of him on 7003 and 14020 c.w. QSL to Carlos Alberto de Araujo, Box 3, Fernando de Noranha, Brazil.

There is a change of operator reported for Gough Is. Paul was due to leave in mid-May, and Sandy ZD9BO will be the new operator. His QSL manager will be ZS2RM, Box 9101, Pt Elizabeth, C.P., Sth. Africa.

Republic of Guinea should be represented by 3X1SJ who was due for a two-month jaunt from mid-April. He is ON5SJ, Jean-Claude, whose QSL task will be undertaken by W4SPX.

Mauritania is still represented by 5T5BG who operates mainly c.w., and although it is a little early in the day for us, he is QRV 3815 or 7015 at 0530. The other operator 5T5AD has returned to France, but will be back in a couple of months. Both were due to operate ITU station on 16th May.

Mention of San Marino earlier in this page reminds me that somebody recently queried the operation of M1B. Geoff Watts in his bulletin of May 12 gives a full run down on Mario's activity which is sufficiently interesting to warrant its printing here. M1B has daily skeds with I1AA, I1ZIN, I1ZJG on 14315 s.s.b. daily at 1300-1400. He skeds QSL manager WA3HUP on 21290 s.s.b. Sat. and Sunday at 1400; if conditions poor he will QSY to 28575 at 1415; if 28 is on the blink he then returns to 21290 at 1700. I1ZIN and I1ZJG MC the net. Mario is sometimes on 14300-305 s.s.b. Monday, Wednesday or Friday at 1900-1930 in net with WA3HUP and SV0WI.

A newie for the prefix hunters is W8MDI, a novice from American Samoa, who operates on 21177, usually around 2150. His QSL address is Box 788, Pago Pago, American Samoa, 96920.

Another for its prefix value only is 3Z0L, the Lenin Centenary Exhibition Station who has been coming in on around 14273 around 2000. QSL to Box 288, Warsaw, Poland.

If you happened to come across 3A2ARM during the aforementioned World Telecommunications Day, your QSL can be obtained from 3A2CN, 41 Bvde du Jardin Exotique, Monaco. The first 300 QSLs received were to receive special Monaco stamps on their return envelopes.

If you are missing a QSL from VK0LB who went QRT at the beginning of April, try Jeff Liebgold, C/o. Barry Research, 934 East Meadow Drive, Palo Alto, California, U.S.A.

For five band DXCC hunters, ZS0BT is often to be found on 21035 c.w. at 1800 and will QSY to the other bands on request. Some may argue that this would not be possible at this time, but I have noted some very early openings on both 15 and 10 of late, so it may be a reality. In any case, a letter to E. Cook, 32 Grove Rd., Gardens, Johannesburg, may get you a sked, and this is also the address for his very rapid QSL.

Jim 9V1PR and XYL Jean 9V1PS, now at 4-J Rosyth Rd., Singapore 10, sends his regards to the DX gang, and will be looking for contacts in that field. He is Jim Smith, ex G3HSR.

Some further clarification on U.S.S.R. bases is available from the Long Is. DXA. UP0L are North Pole drifting stations in Zone 40. UA1KAD Alexade I, Franz Josef Land, Zone 40; UA1KAE/1 Mirny, Antarctica, /2 Oasa Base, /3 Pionierskaja Base, /4 Komosomolskaja Base, /6 Vostok Base, /7 Sovietskaja, all in Zones 29 and 30, whilst UA9Y is in Tannu-Tuva, Zone 23.

The mystery surrounding the inclusion of Market Reef for DXCC credits has been officially finalised, and I note that OJ0 Market Reef is an addition to the Australian DXCC list. Contacts after Dec. 27, 1969, are valid.

Some of the stations active from EP land are Alf EP2TW, who works mainly 10, 15 and 20 s.s.b., but shortly will have gear for 80 and 40. QSL to GI3HXV. Other active EPs are 2BI, BQ, CN, DA, DK, FB, HL, JP, SW, WA, WB and EP2YL, who is a YL.

AWARDS

TA Ten Diploma.—This award is yours if you have worked ten TA stations. As in the special Istanbul award, you can claim again for each station heard on another band. Licensed stations are TA1AV, CEM, DS, HY, IB, KT, MGP, MT, NC, NF, OR, QR, RF, RT, SK, VG, VY, WR, TA2AC, AE, BK, CD, EA, EM, FK, FM, QR, SC, TA3AR, AY, OZ, RK, and TA9A. GCR list plus 10 IRCs to T.R.A.C., Box 699, Karakoy, Istanbul, Turkey.

Pribram Award.—For working or hearing three Pribram stations during the period April 15 to December 31, 1970. The award is free, you need log extract and QSLs, mailed by Feb. 28, 1971, to OK1AKM, Vladimir Necas, Necas, Prazska 36, Pribram LI. Your three will be amongst the following: OK1AAZ, ADV, ADY, AHB, AHI, AKM, AME, BD, FAH, FBF, FBG, FBL, FBS, FVS, HL, KNG, KPB, OFA, RG, XC, YR, OL1ALO, OL1ALY, OL1ALZ and OL4ANI/P.

Ravenna Award.—A simple one, work Ravenna stations I1BIR, CHW, CIK, SMN, STD and TLK, and send your QSLs to I1SMN, Box 6, Ravenna, Italy.

WAEIP (Provinces) and WAEIC (Counties).—Issued by I.R.T.S. Region 1 Awards Committee, C/o. EI8CC, 47 Hazelbrook Dr., Terenure, Dublin 6. The Provinces award for working or hearing four stations in Leinster, four in Munster, one in Connacht, and one in Ulster. The Counties award class one for working or hearing 26 counties, class two requires 18 counties, and class three eight counties. Ulster counties are Cavan, Donegal, Monaghan. Leinster counties: Carlow, Dublin, Likkenny, Laois, Longford, Louth, Meath, Offley, Westmeath, Wexford, Wicklow. Connacht consists of Galway, Leitrim, Mayo, Roscommon, Sligo. Munster consists of Clare, Cork, Kerry, Limerick, Tipperary, Waterford. Your GCR list, plus 8/- sterling, or 10 IRCs, is required and endorsement is available for all modes or bands.

73 de Don WIA-L2022.

CONTEST CALENDAR

4th/5th July: New Zealand Memorial Contest (3.5 MHz. only).
15th/16th August: Remembrance Day Contest.
3rd/4th October: VK/ZL/Oceania DX Contest (phone).
10th/11th October: VK/ZL/Oceania DX Contest (c.w.).
10th/11th October: R.S.G.B. 28 MHz. Phone Contest.
24th/25th October: R.S.G.B. 7 MHz. DX Contest (c.w.).
7th/8th November: R.S.G.B. 7 MHz. DX Contest (phone).
5th Dec. '70 to 11th Jan. '71: Ross A. Hull V.h.f. Memorial Contest.

D. H. Rankin, Federal Executive.

Overseas Magazine Review

Compiled by Syd Clark, VK3ASC

"BREAK-IN"

March 1970—

Solid State Circuits for S.S.B., ZL2BDB. Part 2 of an article by J. W. Herbert of the Central Institute of Technology, Petone.

Squelch Unit for the Southland Branch Transceiver, ZL2VP. A description of a simple, solid state squelch unit.

T.V. Tuners and V.H.F. Converters, ZL1BAU. A modified t.v. tuner makes a handy v.h.f. converter which covers a number of bands. The writer has seen designs using older style tuners, which covered frequencies right down to about 80 metres.

"CQ TV"

No. 69—

After Glow. Discusses various types of phosphor which are available and the advantages and disadvantages of each for Amateur T.V.

ATV Demonstration at Harwell—

I2TV. A note on the equipment used by Prof. Franco Fanti, I1CLF, of Bologna, Italy. Main object is to solicit contacts with others similarly equipped.

Vidicon Blanking Generator. Describes a small unit for flyback blanking.

"CQ"

March 1970—

Safe and Sound Tower Installation, Part 1, W2NZ.

A Homebrew All Solid State Communications Receiver, W0RWH. Tunable i.f. on 2.955-3.155 MHz. working into mechanical filters on 455 KHz. Front-end converters are crystal controlled.

"CQ" Reviews the Heathkit HG-10B V.F.O., W2AEF. Uses a 6CH8 and OB2 regulator.

A Pre-Amplifier for Tube-Type Transceivers, W2EEY. Take your choice of 6EH7 and 12BZ6 to add front-end selectivity and gain to transceivers in need.

The Invisible Ham, W0GHX. A fantasy indicating what might be accomplished by a very smart Amateur with plenty of "dough". Automation gone wild!

Modern Remote Tuning, W2EEY. Motor driven tuning systems can be replaced by capacitance diodes and lamp-photocell modules. Various techniques are discussed and sample circuits are included from several transceiver units.

All About Microphones, W2FEZ. A useful article which will inform the novice and refresh the memories of others.

A Handy-Dandy Variable A.C. Supply, K3STU. A boxed Variac with metering.

An A.M. High Powered Amplifier, W4CJL. Operating on 80 and 40 and using a pair of 4-1000As in the "Doherty" circuit.

A Solid State V.H.F. Regenerative Receiver, W6JTT. One transistor and one IC.

April 1970—

An All Band 4CX1000A Super Cathode Driven Amplifier, W7GVL. There is always something new to work on.

A Simple D.C. to D.C. Converter, K4PZW. The t.v. flyback transformer core finds its way into Amateur Radio to supply voltages for a transceiver. Will the copyists please tell me why he broke one leg?

Notes on Transistorised Transceiver Construction, VE7BRK. Larry calls upon some commercial experience to make some suggestions for use in Amateur Radio.

A Good R.T.T.Y. Control Layout, W0PHY. Short and sweet switching system.

A Cheap and Clean Scope Cart, Jim Ashe. Taking mahommet to the mountain!

Saga . . . A Submerged Antenna Propagation System for Enhancing DX, ex YM4XB. Great v.h.f. DX. Underwater.

Safe and Sound Tower Installation, Part 2, W2NZ. Finishing off the job that was begun last month.

"CQ" Reviews: Ten-Tec Power Mite Solid State Transceivers, W2AEF. Simple and cheap but they work. Anyone for QRP c.w.?

A V.H.F. Quadrature Phase Amplifier, by W4KAE. Ferrite devices at v.h.f.

Improving the SX-101A for DX Performance, W7VW. Making a good receiver better.

"HAM RADIO"

March 1970—

Broadband Double-Balanced Modulator, by WA6NCT. Practical construction details of a hot-carrier diode mixer that covers the range 200 KHz. to 250 MHz.

Compact Dual Band Antennas, W6SAI. Simple but effective antenna systems for city-lot dimensions or portable use.

Tunable Peak-Notch Audio Filter, John H. Schultz. Solid state circuits featuring the twin-T network—useful in test equipment or for improving receiver selectivity.

Further Automation for Typewriter Type Electronic Keys, W6PRO. A buffer storage unit is described which increases the versatility of the "Pro-Key" marketed by the Micro-Z Co.

Homebrew Five-Band Linear Amplifier, by W7IV. A conservatively designed unit using time proven 811As. A pair of these tubes operating with B plus of 1500 volts is about the right power input to meet the VK licensing requirements.

A New Approach to Equipment Rack Construction, K1EUJ. Here's a low cost rack that can be easily built to accept any panel width. (I believe the material used in this job is obtainable in Australia under the name of "Uni-Strut".)

Solid State Radio Direction Finder, W6JTT. D.F. principles are detailed and various methods are described. (Will this bring the tx hunt back?)

A Power Amplifier for 1296 MHz., W2CCY. Dual planar triodes in a half-wave resonant cavity provide 100 watts output with 10 dB. power gain.

A Low Power Solid State Transmitter for Two Metres, W. G. Eslick. The will to improvise, plus salvaged t.v. parts, resulted in this little bomb.

Economical Beam for Ten Metres, W1FPF. Improving the "Wonderbar" antenna for effective DX work.

A Stable Small-Signal Source for 144 and 432 MHz., K6JC. This simple circuit features variable frequency and amplitude control of a reference signal for v.h.f. converter adjustments.

Regenerative Detectors and a Wideband Amplifier, W8YFB. Easy projects to acquaint you with transistor circuits, with hints on determining the correct component values and some good advice on power supply design.

April 1970—

It is perhaps unusual to begin a review by discussing an advertisement, but on page 6 of this issue Swan announce a new 16 crystal filter with a 6 dB. bandpass of 2.7 KHz., 60 dB. bandpass of 3.475 KHz., 120 dB., bandpass of 4.9 KHz. and an ultimate rejection exceeding 140 dB. Price is quoted as $30 (in U.S.A.) to Swan users only. Some filter!

Operational Power Supply, WA2IKL. Regulated d.c. supply, low-frequency amplifier, current amplifier, with bipolar output—these are just a few uses for this unit.

A Simple Speech Processor for S.S.B., K6PHT. Using a FET input stage and four bipolar transistors, this speech processor is stated to increase the effective speech level by about 10 dB. whilst maintaining distortion at a low level.

An Electronic Thermometer, VK3ZNV. A simple but effective instrument that can be built in just a few hours.

Catalina Wireless 1902, W6BLZ. Another glimpse into the early days of Radio by an old timer who knew older timers . . .

Variable Bandpass Audio Filter, G. B. Jordan. One solution to the receiver selectivity problem is this RC feedback system featuring variable bandwidth to less than 50 Hz.

R.F. Power Amplifier for 432 MHz., K6JC. 180 watts input on c.w. and 85 watts on a.m. to a 5894. Featuring resonant line tank circuits and class C or AB1 operation.

Improving Overload Response in the Collins 75A-4, W6ZO. Simple modifications provide 12 dB. higher signal handling capability in this fine receiver.

Direct Reading Capacitance Meter, ZL2AUE. An easily built instrument with many uses around your station.

Twenty Four Hour Digital Clock, K4ALS. With nixie readout.

A Low Power Dummy Load and R.F. Wattmeter, W3OLU. An accurate and reliable test instrument which is low in cost. Uses an old thermocouple r.f. ammeter calibrated in watts into 50 ohms.

How to Use a Sweep Generator. Larry Allen takes the newcomer to the repair bench and shows him how.

An All Band Ten dB. Power Attenuator, by K1CCL. This device can be used as a transmitter interstage buffer or for isolation when making antenna v.s.w.r. adjustments.

V.S.W.R. Alarm Circuits, W2EEY. Here are some additions you can make to your v.s.w.r. meter to give aural or visual warnings of v.s.w.r. changes.

"QST"

March 1970—

An Engineer's Ham Band Receiver, DL6WD. An all solid state design for the experienced constructor. The h.f. local oscillator uses a frequency synthesis technique. Single conversion design using KVG 9 MHz. filters.

High Versus Low Antennas, K6YNB. Compares the performance of identical antennas mounted side by side at different heights. Experimental evidence is given to support the case for increased antenna height for better results.

A Simple Safety Feature for Crank-up Towers, KH6IJ. Preventing winch pawl slip.

Packaged QRP for 3.5 and 7 MHz., W1CER. Transmitter 2w. from 12v. receiver a few mA. Peak current 800 mA. All solid state.

The K4GGI 220 MHz. Kilowatt Amplifier, K4GGI. H.F. efficiency at the top end of the v.h.f. range.

A Two Element 15 Metre Quad for the Novice, WN9BJC. Spreaders are combination of aluminium and plastic water pipe.

A Co-axial Switch with all Unused Contacts Shorted to Ground, W1ICP.

Let's Talk Transistors. Part 5. Transistor Circuits. Robert E. Stoffels.

A Trap Filter Duplexer for 2 Metre Repeaters, W1HDQ. Keeping transmitter power out of the receiver.

April 1970—

The Mainline ST-3 R.T.T.Y. Demodulator, W6FFC. Two versions are actually described. The ST-3 for 850 Hz. shift and the ST-4 for 170 Hz. Small and solid state.

A Receiver Matcher and Pre-Amplifier, by W1ICP. An FET pre-amplifier for those whose receivers have insufficient front-end selectivity and gain.

Improved 15 Metre Portable Performance for a Mobile Station. W3HTF attaches 60 ft. of wire to his mobile whip below the loading coil and improves his distant signals thereby. The far end is thrown over a convenient tree.

Let's Talk Transistors, Part 6. Robert Stoffels continues with his topic "transistor circuit operation".

A Practical Solution to an Impractical Problem, W5LQH. How to erect a 40 ft. tower and a large beam, in limited space, without getting off the ground. Which is the harder, digging a 35 ft. well, or climbing a tower?

Building a Skinnier Linear, W1CER. Describes a grounded grid linear using an Amperex 6LF6 40-watt plate dissipation colour t.v. line scan pentode. (Philips cannot supply there in Australia.)

Clamping Diodes for C.W. Break-in, W7BZ. A dozen diodes and the doovers done.

Relay Switching for Increasing Receiver Sensitivity and Transmitter Output from the Heath HW-17A, W1HDQ. Thanks for the review, Ed.

Using the Yaesu Musen FTV650 Six Metre Transverter with the S/Line, KH6IJ. Mr Collins may not like it, but Fred will not object.

Tuning Indicators for the Linear Amplifier, W1KLK. There appears to be more to this subject than a simple "dip and load".

Radiation Patterns of Vee Dipoles over Perfect Ground, K4GSX. For the academic.

"RADIO COMMUNICATION"

March 1970—

Ropes and Rigging for Amateurs, G3JMG. Michael Gale (truly a stormy type) is a Board of Trade certificated yachtmaster (Ocean) and he knows his ropes. Every Amateur needs a basic understanding of this subject so that his aerials will be long-standing.

Receiving Amateur T.V. Transmissions, by G6ACU/T and G3PYB. How to get started using a standard t.v. receiver. Multi-standard operation is discussed. V.h.f./U.h.f.

A Facility for the Top Band to Ten S.S.B. Transmitter, G3HVA.

The G3SEC Tone Pulser, G3SEC/ZS6TC. Designed to be used for the adjustment of linear amplifiers or for chasing t.v.i.

Technical Topics, G3VA. Pat Hawker covers his usual wide range of subjects. This issue is devoted mainly to linear integrated circuits and their uses.

"RADIO ZS"

March 1970—

This issue deals principally with the Annual General Meeting held at a place called Kroonstad. There is a short article by ZS4IO, titled "Improve That Receiver R.F. Stage" which describes a cascode circuit using a E188CC.

ZS4UH describes a tri-band Quad, in Afrikaans.

"SHORT-WAVE MAGAZINE"

March 1970—

Transmitter H.T. Supplies, G3OGR. Circuitry and design considerations. Ratings and choice

of values. Valve and solid state circuits are covered.

TR2002 Conversion for Two Metres, G8BUS. A useful transmitter/receiver combination combination which can easily be converted to two metre operation and makes an excellent "stand-by" unit.

Calculation Simplied, G3PEQ. Could be of considerable help to candidates for A.O.C.P

D.C./D.C. Power Supplies for Mobile, G3SRY. Two inverter circuits.

VK/ZL Cruise, H.M.S. London, G3JFF/MM. Readers of "A.R." will remember that Mike Matthews, Chief Radio Supervisor in H.M.S. London visited Melbourne and other Australian cities during January 1970.

April 1970—

A Monitor for T.V.I., G6HL. A device for continuously checking the transmitter during operation.

Some Useful Circuits for Your Notebook, ZS5HF 0-15 volts, regulated p.s.u. at 1 amp. ZL1UI Audio Peak Limiter for A.M./S.S.B. ZL2ALC Two-Tone Test Oscillator GM8APX Wide Band Signal Injector

The New Marconi H2900 Sophisticated professional receiver covering the frequency range 1.5-30.1 MHz.

Getting Out on Top Band, G3VLX. Even if you have a small back yard, you can still produce a signal on 160 metres.

Easy Top Band Transmitter, G3OGR. Uses up some surplus valves to run ten watts input on 160 and provide power for the aerials described above.

Transistor Bug Key, G3PVH.

Simple FET Voltmeter, Staff

"THE AUSTRALIAN E.E.B."

Over a number of years the name of R. L. Gunther kept cropping up in relation to various Amateur matters in Tasmania and also in respect of a small, newsy and informative publication known as "The Australian E.E.B." (Electronics Experimenter's Bulletin). Occasionally I saw a copy of the publication and had the opportunity of examining its contents.

During the latter part of April I happened to be visiting VK7 on business and had the good fortune to meet Dr Leo Gunther at the Hobart Technical College. Arrangements have now been made for copies of "The Australian E.E.B." to be sent regularly for review. I feel certain that the Amateur who is experimentally minded will find much to interest him in this publication.

February 1970—

Photophones for the Amateur, VK5DZ. Deals with short distance communication using modulated light.

Further Notes on High Quality Receiver Design, K. A. Harding (VK3) Describes the design and operating principles of the Plessey PR155, solid state, general purpose, communications receiver. Frequency range 60 KHz. to 30.1 MHz.

Review. R.L.G. reviews the contents of "73 Diode and Long Wire Antennas."

Regulated L.T. Power Supply Design, VK7RG. Part 1, basic emitter-follower configuration. Basic design details, curves, etc., are given.

March 1970—

A Nice Hi-Fi Amplifier System, Part 1, A. Whittingham (VK2) Uses a unit of commercial design available from Philips, Mullard or Fairchild and capable of an output of about 3w.

A Versatile Transistorised Ignition System, L. E. Thomas (VK6) Most Amateurs are car owners.

Transformer Rejuvenation, H. Bracken, VK7BR. Some of those old transformers you have had stored under your house may need some attention before they are put back into service.

SCR Two-Period Timer, E. Kershaw (VK3) A useful load switching device.

Regulated Low Voltage Power Supply Design, Part 2, R.L.G. Takes you on from where the subject left off last month. More curves, diagrams and elaboration.

April 1970—

A Nice Hi-Fi Amplifier System, Part 2. Putting a box around the bits.

SCR Pulser, L. J. Yelland (VK3). If your pulse is weakening, try this.

When Not To Interpret C.R.O. Curves (VK3 Anon.) Things are not always what they seem to be.

Another Series Type Transistor Ignition, K. H. Vieritz (VK4) To make your bomb a hot performer.

The Legal Position on Light Beam Communications, Staff Conclusion is "even a torch should be licensed" (Monopoly gone mad!")

Windscreen Wiper Delay System, L. E. Thomas (VK6) Some people are never satisfied. I wonder if this author was one of the occupants of a Morris 1100 I once saw, soon after their release by B.M.C., with the sign in the rear window, "Transistorised Rolls Royce".

Continuously Variable Windscreen Wiper Speed Control, R.L.G. and G.R.J. More on a similar subject.

L.T. Regulated Power Supply Design, Part 3, R.L.G. Battery makers beware.

A Crystal Checker and Frequency Comparator for V.H.F., I. N. Kallam (VK3). Where will technology stop?

One of the things I like about "E.E.B." is its uninhibited approach to things. Much good advise on electronics and general topics of interest to the modern Radio Amateur.

Obtainable from "The Australian E.E.B.," P.O. Box 177, Sandy Bay, Tasmania, 7005. Price 25c copy. 1 year $1, 3 years $2. (eight issues yearly).

"73"

March 1970—

Extra Services from Your Grid Dip Oscillator, WA4UZM. Like checking crystals, tuning f.m. receivers and such.

Reverse Current Charging, K8YUC. Turns out you really can re-charge flashlight batteries. (A good technique, if it works. Triers please report.)

A Poor Man's Frequency Meter, W6YAN Combines surplus from two services.

Professional PCs from Roll-Your Own Negs., K6MVH. Eliminates drafting. Camera work and dark room entirely.

How I Read the RO's Handbook and Found Happiness, Johnston. Instant profundity.

A Look at Amateur F.M. [redacted], WB6DJT Or, how do we get out of this mess.

An Inexpensive R.F. Wattmeter, WB4MYL. Surplus meter for those too cheap to buy a regular wattmeter.

A Remote Multi-Frequency Oscillator for Surplus F.M. Units, W2ACM. Drive people crazy on lot more f.m. channels with this.

Add Spotting to Your V.F.O., K8BYO. If your v.f.o. is unspotted.

Towards an Ideal Solid State I.F. for Amateurs, K1CLL. Closing in on the state of the art with Bill Hoisington.

Ham Exchange, WA2ELA. Visiting foreign Amateurs makes trips more enjoyable.

Super Sixer, WA3AQS. Heath wouldn't recognise it.

Bob, Bob, Bobbin' Along, K1YSD. Special April feature article.

The Dip Light, VE3ECU. A grid-dip meter with no grid and no meter.

"73" Checks Out the Kris Scanning Receiver, Staff Snazzy.

A C.W. Monitor, WB2GQY Using a $86 audio module, you cheapskates.

The Logical Approach to Surplus Buying, Jim Kyle. Here's your key to fun with those surplus logic circuits.

Converting the Sonobuoy to a 2W. F.M. Rig, W1BYX. Two metres, why not have some fun with this one.

Easy Diode Testing, K4JK. Checking out those bargain diodes.

Turning the AN/GRC-9 into a Novice Rig, W6JTT 2-12 MHz. transmitter-receiver. (If it does not work, check e.t. of rx h.t. supply —VK3ASC.)

Extra Class Study Course, Part 14, Staff Measurements.

V.H.F.—F.M. and You, K2STH. Part of our Encyclopaedia of F.M.; a good part.

April 1970—

The banner headline proclaims this a "Special F.M. Repeater Issue".

A Noise Blanker That Works, W8RHR. As opposed to that crummy one on Brand X which doesn't work. Can be added to your present receiver easily. (On p. 18 the author acknowledges that he pinched the circuit from R. L. Drake.)

Hot Carrier Diode Mixer Converter, WA6NCT This is not an April Fool article.

Examining F.M. Repeater Operation, WB6DJT. History of repeaters, A.R.R.L. involvement and legal problems.

A Repeater Controller, WA4YND. Tone generator timer, identifier, the lot.

Understanding the Carrier Operator Repeater, K6MVH. Some of them take a good deal of understanding.

Evaluation, Standard 2 Metre F.M. 12-Channel Receiver, W6QGN. Okay.

7/8 Wave Mobile Antenna for Two Metres, W2EUP Why have a puny signal when you can have a mediocre signal.

How Do Ham Stores Decide Their Trade-in Figures, W2CFP $200 for your S38?

Beryllia, the Lethal Refractory, WB2PAP. Worse than cyclamates.

Getting Your Extra Class Licence, Part 15, Staff Spurious radiation is covered.

A Work Session on the Wichita Repeater, W0DKU If anything can go wrong . . .

Inexpensive Semiconductors for the Ham, WA7KRE. Giant Motorola ad that we paid for.

Renovating Surplus Meters, WA0ABI. Making new scales, calibrating, etc.

A Bias Regulator for Linears, ZL2ANG. Simple gadget that makes class B practical.

High Performance I.F. and A.G.C. System, ZL2BDB. Particularly for c.w. and s.s.b.

Single Sideband on the All-Wave Radio, W7CSD One transistor b.f.o. and no connections.

Vacuum Tube Load Box, Jim Ashe Invaluable for testing power supplies. (During 1963 a similar device using 6L6s was built for use at the Army Apprentices School, Balcombe, Victoria. It was only designed to pass a current of about 150 mA. Had 807s been used, the current could have been run up to 200 mA at about 750 volts. A much more versatile device for testing power supplies with current outputs up to about 1 amp. can be constructed by using four series strings of 240/250 volt lamps which can be connected in parallel by suitable switches with a unit similar to that described for fine adjustment between steps. VK3ASC.)

Repeater Directory, Staff. Special feature giving details of the U.S. repeater locations, frequencies, etc.

A Word About Repeaters, WB2AEB A special featurette.

The Fine Points of F.M. Operation, WB2AEB. Getting on frequency and other fine points.

How to Megger Your Antenna, W2EEY It's not too dirty.

☆

S.A.A. REPORTS

SAFETY OF TELECOMMUNICATIONS EQUIPMENT (TE/1)

A working group met in April to complete the details of a revision of AS C159-1959 Ap. A revised draft is now being issued for review, with specific comment being sought on certain sections of the draft that cannot yet be resolved. For example, the problem of applying the usual insulation and high voltage tests to equipment containing solid-state circuitry is felt to require a new approach.

RADIO INTERFERENCE (TE/3)

At the April meeting of this committee, the main subject under discussion was the setting of acceptable limits for local oscillator radiation from television receivers. The problems of measurement, of manufacturing within limits, and of affording the protection required by other services, were found to be very considerable but compromise proposals will be incorporated in a draft to be issued for public review and further investigations will proceed in the meantime. The concept of "immunity" as it applies to t.v. receivers was discussed at some length, and a working group was appointed to study a method of measurement.

RADIO COMMUNICATION (TE/14)

This committee at its last meeting broke up into three sub-committees dealing respectively with radio reception, radio transmission, and aerials, and the sub-committee meetings proceeded simultaneously. A joint meeting was then held at which progress in the specific sections was reported, and guidance was given regarding further work at the sub-committee level.

(Reprinted from the Standards Association of Australia May 1970 Monthly Information Sheet.

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PROVISIONAL SUNSPOT NUMBERS

MARCH 1970

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	134	16	45
2	126	17	29
3	112	18	41
4	101	19	45
5	107	20	93
6	100	21	115
7	108	22	122
8	116	23	131
9	119	24	140
10	123	25	142
11	100	26	122
12	84	27	115
13	104	28	110
14	84	29	103
15	65	30	111
		31	101

March 1970 Mean equals 101.7

Smoothed Mean for Sept. 1969 105.8.

Swiss Fed. Observatory, Zurich.

SILENT KEY

It is with deep regret that we record the passing of—

VK3AW—L. G. McCluskey.

COOK BI-CENTENARY AWARD

The following additional stations have qualified for the award —

Cert. No.	Call	Cert. No.	Call	Cert No.	Call
239	VQ8CW	283	AX3AXQ	327	AX4FH
240	K4RTA	284	DL8VF	328	K3FMP
241	DK1YG	285	AX1MR	329	ZS6KC
242	W1HH	286	ON4IZ	330	G3DZS
243	G3BHW	287	SM5EXE	331	AX4GT
244	W2LBK	288	W8LAX	332	AX7MG
245	AX3BBA	289	KP4BBK	333	G4RS
246	GI3TLT	290	ZS3OM	334	ZL2NO
247	ZE2JA	291	AX2FC	335	ZM1AIZ
248	ZE1CX	292	W2CCS	336	VE4ZX
249	W8LWU	293	G8WB	337	WA6GLD
250	JA2IYJ	294	W7JRT	338	ZM1AUJ
251	W8MXW	295	WA4TSP	339	ZE1DO
252	ON5MG	296	AX2IK	340	AX3HZ
253	W3LMA	297	GM3UCI	341	VE3EFX
254	W8LRE	298	G8DO	342	AX3AYF
255	VO1CU	299	WA5JSI	343	W6CJW
256	W3KPI	300	AX4GU	344	W2BXC
257	5H3LV	301	AX2BNA	345	VE7BJR
258	YV4UA	302	KR6RH	346	AX4CZ
259	JA1INP	303	W4MGL	347	G3UHR/VO2
260	W8KZO	304	KX6BQ	348	AX2BB
261	W4YK	305	F9MD	349	VR5LT
262	K1BHN	306	G3DRF	350	AX9TB
263	F3AT	307	ZM1RD	351	G3BDS
264	AX3ACY	308	F3II	352	ZM2ACP
265	AX3DO	309	VE5AY	353	OX3AP
266	W0EBG	310	AX7LS	354	AX7CH
267	W3JK	311	9V1HD	355	GW3HUM
268	AX3AMI	312	GI4RY	356	8Y4VV
269	CT1QN	313	ZE8JW	357	W5EL
270	GI6TK	314	WA1LDA	358	WA2CHZ
271	G6JM	315	W2IRD	359	G2CKN
272	W8JFD	316	G3WGS	360	K4CX
273	WA6JVD	317	G2DCG	361	W6ZC
274	GI3SSR	318	AX4FX	362	W3EEK
275	VE3BAP	319	VE1YY	363	AX1AOP
276	WA2ZIS	320	DL6CA	364	AX2PA
277	WA8GXL	321	W5WJQ	365	AX4RG
278	W3EVW	322	VE5BM	366	VR2FT
279	AX8CT	323	K3FUH	367	ZM1ON
280	VE3ZN	324	W8GV	368	AX3DS
281	AX6RD	325	K6EKH	369	W6KIT
282	W3NKM	326	VE6MJ	370	AX7IL

—Federal Awards Manager, W.I.A.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

COOK BI-CENTENARY AWARD

Editor "A.R.," Dear Sir,

For the 100 per cent. c.w. operator the first requirement—three AX1 contacts—is a knock-out blow. No need to read further. The AX prefix is appropriate—Brasspounders are AX-ed. Little wonder that so many c.w. stations are using VK in 1970. It is much easier to QSO the 50 ZM stations for the Award. Forget any hopes of AX1 c.w. in 1970 R.D. test. Not one VK1 c.w. station submitted a log in the 1969 R.D. Mention is made of the special significance of 1970 and the W.I.A. Anniversary. The W.I.A. cut its teeth on c.w. and for almost 30 years after, so why make it impossible, or so it appears for c.w. operators to obtain an AX award? It will be of interest to ascertain how many 100 per cent. c.w. operators obtain this award.

Arch Hewitt, VK5XK.

C.W. REQUIREMENTS

Editor "A.R.," Dear Sir,

Recent correspondence in "A.R." concerning the c.w. requirements for the Amateur Licence raised lots of interesting points and afforded me both much amusement and sad reflection on the calibre of the arguments put forward for its abolition.

The blunt truth is that c.w. is a withholding snag. It cannot be instantly overcome or read up in an evening or two from a book. It requires patience and application which are presently abhorred in this age of Instant Gratification. I'm surprised that no one has yet come forward to say that the theory exam. is unfair to those who have not time, opportunity, mental ability, or plain nouse, to pass it. But that will no doubt come when c.w. has been abolished. The point that is missed is that the Amateur Licence requirements are no different from those for any other profession, trade or even a driving licence. There is a theory exam. to test the applicant's **knowledge** and then a practical test for his **ability**.

Most of us know how a sideboard is made, but you have to have made a real job of one before you start to call yourself a cabinet-maker. A medical student may be a wizard on blood, bones and nerves but he will never become a doctor while he puts the stethoscope up his nose instead of in his ears! Likewise the c.w. test is the only practical way the authorities have of ascertaining whether we are remotely competent to be let loose on the world wide communication frequencies. It could not be replaced by submitting a piece of home-built equipment, like a masterpiece for admission to a craftsmen's guild. That would be more irksome than learning c.w.

What will be the outcome? Well, if the abolitionists scream, howl and bang their heels on the floor long enough the authorities will no doubt eventually give in, and relax even further the present abysmal level of requirement. But I hope they impose instead a time limit so that this "self training" business is taken seriously for a change.

So VK2ZJC has a good chance of seeing his desires fulfilled before too long whether we old fogies like it or not. But before he congratulates himself he might first ponder on just what he stands to lose, besides his own self-respect in failing to achieve that which others found no great trouble. Morse may seem to him archaic but I suspect that by his standards most other worthwhile abilities are too. It's like learning to play the piano instead of buying a record player. It's not the easiest choice, requires plenty of effort and practice and few ever reach concert standard. But once a modest skill is achieved it remains forever a deep source of lasting satisfaction. And that surely is the main purpose of pursuing any hobby.

—L. J. Smith, VK6LJ.

NO REQUEST FOR INCREASE IN U.S. PHONE BANDS

The American Radio Relay League, Inc. Newington, Conn., U.S.A., 06111.

Federal Secretary, W.I.A.,

Dear Sir,

Last year we reported to you that our Board of Directors would be discussing possible expansion of U.S. phone bands at its annual meeting this year, and requested your comments on how such an expansion might affect Amateur Radio in your country.

We much appreciated the assistance given by your reply, and I wanted you to know that your comments were given consideration by our President, our Planning Committee, and by the entire Board of Directors.

At its annual meeting on 1st May, 1970, the League's Board of Directors decided NOT to petition the Federal Communications Commission for an increase in U.S. phone band at this time.

Again, thanks for your co-operation, 73,

—W1LVQ, General Manager.

HAMADS

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APACHE Transmitter Heathkit TX-1 with handbook $150; Heathkit DM3 5 inch CRO $60; G4ZU commercial 3 element triband beam $60. 1674 Base Station on 52.525 MHz FM $50; Pye of Cambridge Base Station on 53.1 MHz AM 100w., $60, 146 MHz FM 1674 land line Base with remote control, etc., $60; three good QQV06/40s $5 each. All units in excellent condition. VK5AZ, 10 Regent St., Pennington, S.A., 5013. Ph. 42477.

FOR SALE Hallicrafters HT37 Transmitter SX111 Receiver, A1 condition, both 240v a.c., 80/10 mx S.S.B. A.M., etc. $345. John Walker VK2GA 216 Memorial Ave., Ettalong Beach, N.S.W. 2257. Phone Gosford 41-3659.

FOR SALE Lafayette Model HA500 Receiver with manual, near new, $175. Geloso Transmitter G222-TR $100. Lafayette Transistor Analyzer, KT223 $20. Multimeter Model 200H $10. Kyoritsu SWR Meter Model K-109, $20. Sansei Miniature Transistorised Test Oscillator Model TO-3A, $12. Box assorted Valves and Valve Tester, $10. Muhlelsen, 9 Fitzpatrick St., Waroona, W.A.

FOR SALE Prop. Pitch Motor, pair Selsyns, welded wave guide boom, Dural tubing, azi map, all orig., never used—offer and collect. Pat Boyd, VK2AML, 139 Bruce St., Brighton Le Sands, N.S.W., 2216. Phone 59-6636.

FOR SALE: Table Top five-band A.M., C.W., F.M. Commercial Tx, 95 watts o/p., 8 bands 80-10. Self contained power supply. Photo on request. Module type chassis (Power supply voltages ideal for running most s.s.b. rigs). Screened parallel 807s p.a. Would make ideal D.S.B. rig. Stable V.F.O. Complete unit 24 x 12 x 18 inches. As new. Inquiries VK3XD, Glenpark Rd., Eltham North, Vic., 3095. Phone 439-9662.

HAVE YOU lost interest in the construction of the Project—Solid State Transceiver, "A.R.," November '68 through September '69? If so, I am interested in boards, components, and chassis, etc. Send price and details to 26 Elizabeth St., Tea Tree Gully, S.A., 5091.

WANTED AD740 Receiver Type 2635 Handbook, Control Box, Mounting Base and Crystals. Prices to D. Williams, 83 St. Pauls Rd., Sorrento, Vic., 3943. Phone 42026.

WANTED Information on History of Amateur Service; also on early experiments in Amateur Radio (particularly pre 1940) and info on history and origin of W.I.A. Phillip Rice (VK3YCS), 34 Playne St., Heathcote, Vic., 3606.

WANTED. One of the following ¼ kw O.G. Spark Transmitters: Marconi types 241C, 341, 369, 358, 355, 355F; Radio Communication Co. types PS17, T20, T24, T22, T29, or similar small home-brew equipment. Also quenched plate gap dischargers, high voltage mica condensers such as Admiralty pattern 5001 with rating 0.0044 uF 20,000 volt test. R. F. Fisher, VK3BAO, 241 Royal Pde., Parkville, Victoria, 3052.

WANTED TO BUY Receiver type SX28, HRO, BC342 or 348, R1155, Eddystone 750 or similar receiver in any condition. Also converter covering 20 through 10 metres. 6 metre band. Josef Klimes, OK1AKW, 17 McFarlane St., Glenelg North, S.A., 5045.

YAESU MUSEN FR100B Receiver in new condition with many extras, such as F.M. detector, WWV xtal calibrator, 100M speaker, three extra 28 MHz xtals. $250. VK5AS, 39 Tapleys Hill Rd., North Glenelg, S.A. 5045.

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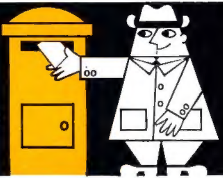

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